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A Review of the Graphite Irradiation Creep Data from the "OC-Series" of Experiments

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OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

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Materials Science and Technology Division

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Abbreviations

esu	elastic strain unit
CTE	Coefficient of Thermal Expansion
FRG	Federal Republic of Germany
OC	ORR-Creep
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Research Reactor
UK	United Kingdom
US	United States

Executive Summary

The original OC-Series experiments planned to irradiate 3 sets of 28 stressed specimens along with their reference specimens to incremental fluences of 1, 2, 4 and 8 (10^{25} n/m^2 E>0.18 MeV) at 600°C, 900°C and 1250°C. Due to funding constraints the OC-Series was cut short and 2 sets of 28 stressed specimens were irradiated at 900°C and 600°C respectively.

Some of the data from these experiments were reported in extended abstracts at a Carbon Conference (Kennedy *et al*, 1977: Kennedy and Eatherly, 1979). Moreover, the OC series creep data was reviewewd and succesfully modelled (with modification to creep strain for dimensional changes) by Kelly and Burchell (1994), and Burchell (2008). The data presented some challenges to the accepted approach to irradiation induced creep in graphite adopted in the UK, specifically lateral creep strain behaviour and the effect of irradiation induced creep strain on material properties, e.g. Coefficient of Thermal Expansion (CTE) and Poisson's Ratio.

A recent review of irradiation induced creep (Davies & Bradford, 2004) included an anlaysis of the available OC-series data (Mobasheran, 1985) and led to a request to ORNL for an examination of the original OC-Series dataset. An initial search of the ORNL archive revealed additional data from the OC-Series experiment including previously unknown irradiation annealing experiments.

The OC-Series archive at ORNL was interrogated and a number of important datafiles were recovered. This project re-analyzed some of the available data from the OC-Series archive and some important findings were made.

1. Previously unknown irradiation annealing data from the OC-Series archive indicates that there is substantial recovery of dimensional change well in excess of values normally attributed to primary creep. Some over recovery in dimensional change was observed and it is recommended that this is investigated further.
2. The 900°C Modulus data revealed some unexpected stressed specimen history behavior when compared to reference history behavior. It was not possible to examine the 600°C in the same way as there were only two irradiation capsules spanning the fluences where the changes at 900°C become apparent. It is recommended that efforts are made to find or evaluate the unirradiated 600°C Modulus data.
3. When the CTE were re-evaluated from dilatometer expansion data a systematic offset was found in the CTE data. This was subsequently attributed to a use of a quartz reference standard for expansion correction.
4. Whilst subject to significant scatter, the CTE data appear to have saturated at 600°C but not necessarily at 900°C. It is recommended that the CTE data are investigated further.
5. The CTE data appear to be well represented by the UK theory.

6. Previously quoted (Kennedy *et al*, 1977: Kennedy and Eatherly, 1979: Brocklehurst and Kelly, 1989) Poisson's ratio and CTE dependence on creep have been demonstrated to be ill founded and as a result should not be considered further.
7. During the archive search substantial data were found on other experiments such as the ORR series and Petten (US/FRG exchange – H-451 & ATR-2E). It is recommended that these are examined in more detail.

Introduction

The OC-Series graphite irradiation creep experiments were conducted in the early 1970s in the Oak Ridge Research Reactor (ORR) at ORNL. The OC Series consisted of 5 experiments, Capsules 1, 3 and 5 were irradiated at 900°C and Capsules 2 and 4 were irradiated at 600°C. Each capsule contained four columns of specimens, two loaded in compression and two un-loaded. The loaded columns had specimens of different diameter to generate two stress levels, 13.8 MPa and 20.7 MPa.

Some of the data from these experiments were presented in extended abstracts at a Carbon Conference (Kennedy *et al*, 1977: Kennedy and Eatherly, 1979). The data presented some challenges to the accepted approach to irradiation induced creep in graphite adopted in the UK, specifically lateral creep strain behaviour and the effect of irradiation induced creep strain on material properties, e.g. CTE and Poisson's Ratio.

A recent review of irradiation induced creep (Davies & Bradford, 2004) included an anlaysis of the available OC-series data (Mobasheran, 1990) and led to a request to ORNL for an examination of the original OC-Series dataset. An initial search of the ORNL archive revealed additional data from the OC-Series experiment including previously unknown irradiation annealing experiments.

This report presents a re-analysis of the available data from the OC-Series archive.

OC-Series Experiments

A series of 12 irradiation experiments were planned to evaluate irradiation induced creep characteristics of a number of graphites when exposed to elevated temperatures and high fast fluences (Senn *et al*, 1977).

Three graphites considered of interest to past and present reactor designers were chosen. A small number of specimens were machined from H-327, which was used as the material for the core structures in Fort St Vrain. A small number of AXF-8QBG1 specimens were included to extend the existing creep database to high fluence. The majority of the test specimens are H-451, a near isotropic medium grain graphite and one of the principal contenders for the proposed 1000 MW(e) HTGR application at that time and core fuel and moderator block replacement graphite in the Fort St Vrain HTGR.

The original series planned to irradiate 3 sets of 28 stressed specimens, 15.24mm diameter by 25.4mm long to incremental fluences of 1, 2, 4 and 8 10^{25} n/m^2 (E>0.18 MeV) at 900°C, 600°C and 1250°C. The original schedule of experiments is shown in Table 1.

	Fluence 10^{25} n/m^2 (E > 0.18 MeV)			
Temperature	1.2	2.4	4.8	9.6
900°C	OC-1	OC-4	OC-6	OC-8
600°C	OC-2	OC-5	OC-7	OC-10
1250°C	OC-3	OC-9	OC-11	OC-12

Table 1: OC-Series Experimental Schedule

A compressive load of 13.79 MPa was applied to 20 specimens in each capsule via a metal bellows, which was expanded by gas pressure against the specimen columns. 8 of the specimens in each column had reduced diameters to increase the compressive load to 20.68 MPa. Two unloaded columns were included in each capsule to act as reference specimens for the loaded specimens. Figure 1 shows the stressed column cross section of the in-core portion of the OC-Series capsule. Figure 2 shows the unstressed column cross section.

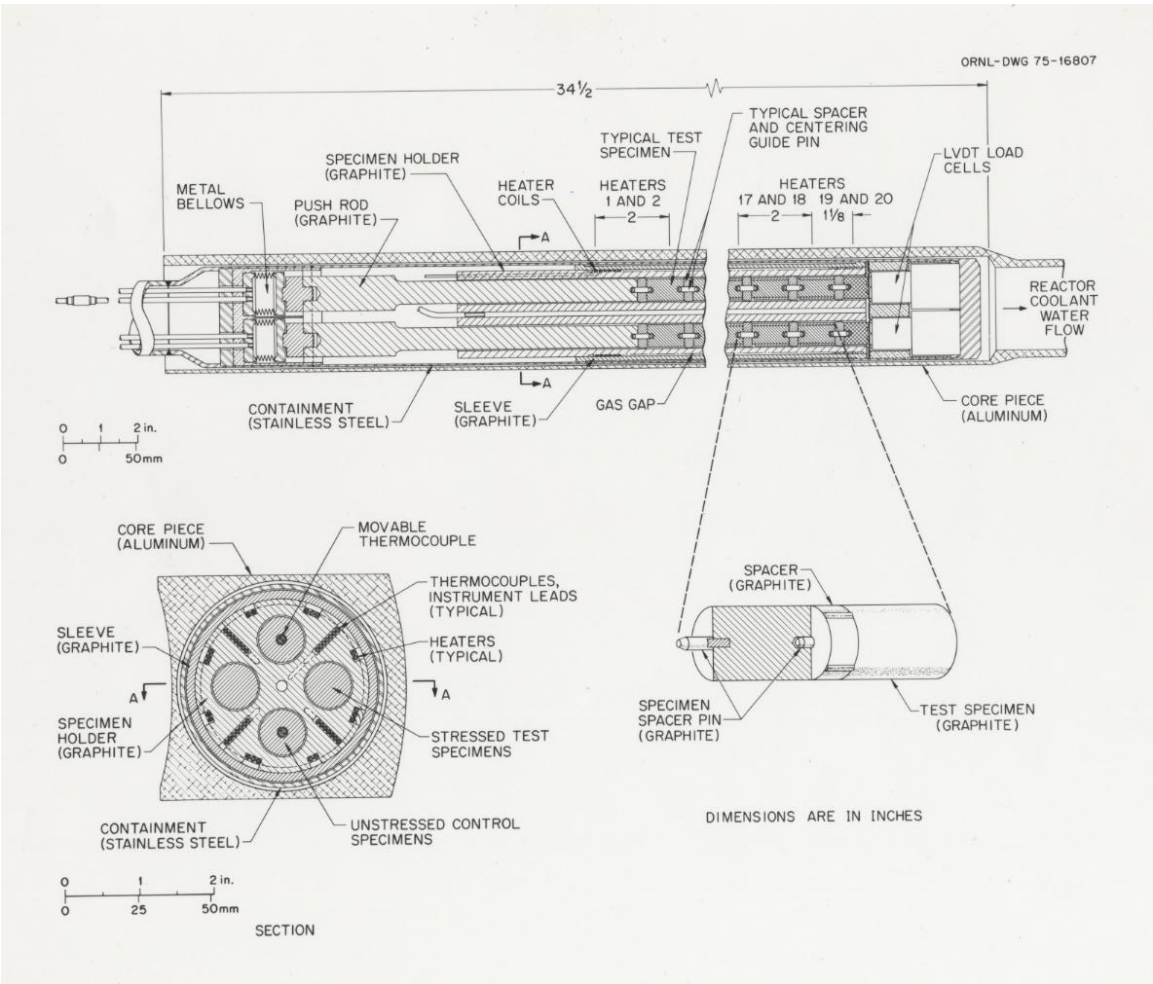


Figure 1: Stressed Column Cross Section

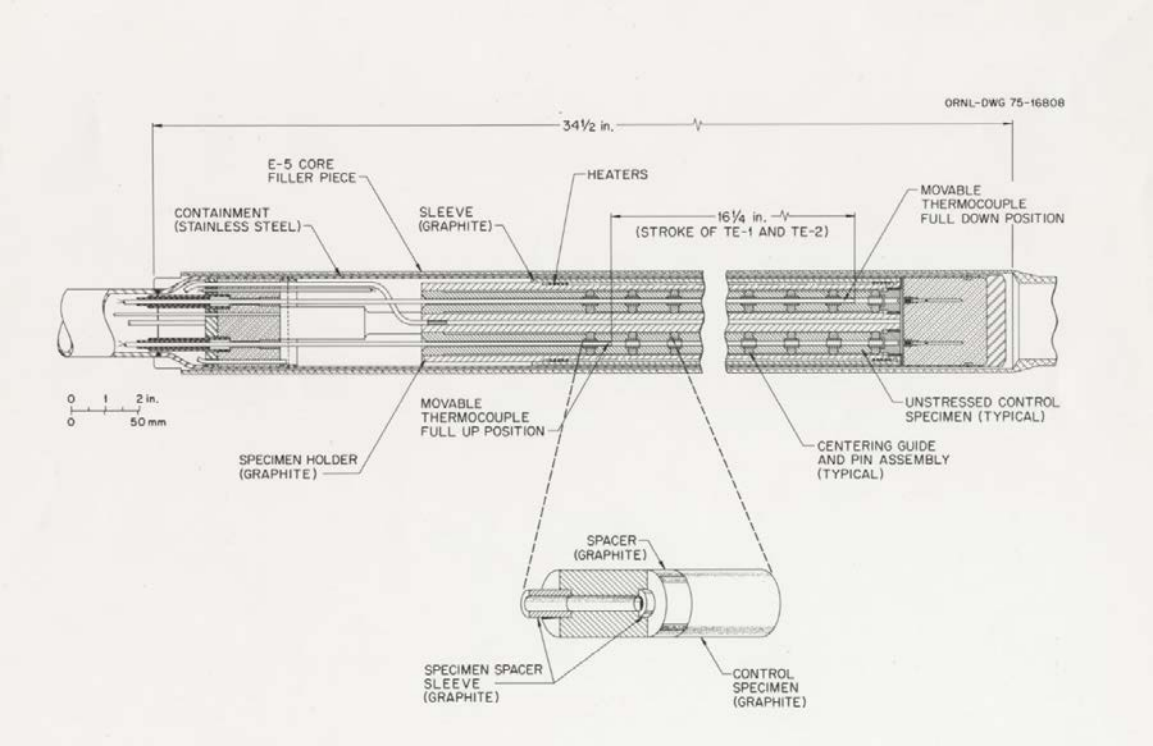


Figure 2: Unstressed Column Cross Section

The OC-Series Capsules included movable centerline thermocouples located in the reference columns, load cells to monitor the applied load and a computerized temperature control system to maintain accurate temperatures over the 0.508m column length.

Table 2 shows the graphite materials for the OC-1 capsule indicating the location material, orientation and load. It is interesting to note that specimens of H-451 (parallel) were chosen with low, intermediate and high Modulus for positions 6, 7 and 8. No reference could be found as to why this was done.

CONFIGURATION OF THE COMPRESSIVELY STRESSED SPECIMENS
IN COLUMNS "E" AND "W" OF CAPSULE OC-1
TO BE OPERATED AT 900°C

TOP

Position	Grade	Column "E"			Column "W"		
		Orientation	Stress	Modulus	Orientation	Stress	Modulus
1	AXF-8QBG1	Isometric			Isometric		
2	H-327	∥			∥		
3	H-451	∥			∥		
4	H-451	∥	High		∥	High	
5	H-451	∥			∥		
6	H-451	∥		Low	∥		Low
7	H-451	∥		High	∥		High
8	H-451	∥		Inter-mediate	∥		Inter-mediate
9	H-451	Radial			Radial		
10	H-451	∥	High		∥	High	
11	H-451	∥			∥		
12	H-451	∥	High		∥	High	
13	H-327	⊥			⊥		
14	AXF-8QBG1	Isometric			Isometric		

BOTTOM

Table 2: Graphite Materials for the OC-1 Capsule

Table 3 shows the planned series of experiments for the 900°C irradiation. The Table clearly indicates that some specimens were planned to be irradiation annealed at various stages throughout the program to obtain data on the recovery of primary creep.

PLAN

Capsule No. →	OC-1	OC-4	OC-6	OC-8
Fluence → (neutrons/cm^2) x 10^{-21}	1	1	2	4
	Number of Specimens x Fluence			
Low Modulus	2 x 1	2 x 2	2 x 4	2 x 8
High Modulus	2 x 1	2 x 2	2 x 4	2 x 8
Intermediate Modulus	6 x 1	4 x 2	2 x 4	2 x 8
		2 x 1	2 x 3	4 x 4*
			2 x 2*	2 x 6*
Primary		2 x 1	2 x 2	2 x 3

RESULT

Number of Specimens x Fluence	
For Secondary Creep	For Primary Creep
8 x 1*	2 x 1
6 x 2*	2 x 2
2 x 3	2 x 3
6 x 4*	
2 x 6*	
2 x 8	

*Could use to introduce second graphite type.

Table 3: 900°C experiment - Specimen Irradiation Plan

The original schedule was never achieved and although a 1250°C capsule was designed no creep irradiations at this temperature were ever carried out. The reduced schedule consisted of 3 capsules, OC-1, OC-3 and OC-5 irradiated at 900°C to a maximum cumulative fluence of 0.53 10^{25} n/m^2 (E > 50 keV) and 2 capsules, OC-2 and OC-4 irradiated at 600°C to a maximum cumulative fluence of 0.513 10^{25} n/m^2 (E > 50 keV). Capsule OC-3 contained some irradiation anneal specimens previously irradiated in OC-1.

OC-Series Data

Historically it appears that the best available source for the OC-Series experimental data was contained in a University of Tennessee Ph.D. Thesis (Mobasheran, 1990). The data available from the Ph.D. is included in this report in Tables 4 and 5 for completeness. Interestingly the data contained within the Ph.D. did not include any annealed speciemen data.

Observation	Graphite	Specimen	Length (%)	Diameter (%)	Volume (%)	Density (g/cm^3)	Fluence (>50 keV)	Unirradiated Sonic Young's Modulus (GPa)	Irradiated Sonic Young's Modulus (GPa)	Irradiated Sonic Shear Modulus (GPa)	Resistivity Side (μOhm.m)	Resistivity Ends (μOhm.m)	CTE (500) ($°C^{-1}$ 10^{-6})	Axial Creep (%)	Axial Creep (%/esu)
1	40-A-C	1101.1090	-0.0930	-0.0180	-0.1740	1.7020	0.0640	8.2740	10.9000	4.4800	14.2600		3.8900	0.0000	0.0000
2	40-A-C	1103.0970	-0.0730	0.0240	-0.0400	1.7090	0.0800	8.4119	11.0800	4.5800	15.8400		3.8500	0.0000	0.0000
3	40-A-C	1104.1120	-0.1100	0.0140	-0.0880	1.7230	0.085	8.61675	11.8300	4.8700	16.0400		3.8200	0.0000	0.0000
4	40-A-C	1105.0990	-0.0900	-0.0370	-0.1910	1.7040	0.095	8.34295	11.5400	4.7800	16.3400		3.7400	0.0000	0.0000
5	40-A-C	1108.0860	-0.1200	0.0120	0.1100	1.7060	0.113	8.89455	11.4900	4.7300	16.4600		4.2800	0.0000	0.0000
6	40-A-C	1110.1140	-0.1300	0.0350	-0.0760	1.7190	0.115	8.49085	11.9000	4.9200	15.8300		4.0400	0.0000	0.0000
7	40-A-C	1111.1010	-0.1270	0.0400	0.0050	1.7030	0.113	8.34295	11.2600	4.6500	16.4600		4.1600	0.0000	0.0000
8	40-A-C	1112.1160	-0.1270	0.0310	-0.0850	1.7170	0.109	8.68770	11.7200	4.8000	15.2700		4.1600	0.0000	0.0000
9	40-A-C	1201.1110	-0.0870	-0.0310	-0.1970	1.7020	0.064	8.34295	11.0600	4.5700	13.4800		3.8100	0.0000	0.0000
10	40-A-C	1203.0980	-0.0970	0.0170	-0.0890	1.7040	0.080	8.41190	11.2300	4.6900	15.4500		4.0300	0.0000	0.0000
11	40-A-C	1204.1130	-0.0870	0.0250	-0.0650	1.7210	0.085	8.54980	11.8600	4.8900	13.3800		4.2100	0.0000	0.0000
12	40-A-C	1205.1000	-0.1150	0.0220	0.0400	1.7030	0.095	8.34295	11.3900	4.7400	14.8700		3.8700	0.0000	0.0000
13	40-A-C	1208.0870	-0.1100	0.0180	-0.0420	1.7060	0.113	8.48085	11.6200	4.8200	16.6000		3.7900	0.0000	0.0000
14	40-A-C	1210.1150	-0.1050	0.0240	-0.1450	1.7220	0.115	8.54980	11.9100	4.9300	18.0200		3.9200	0.0000	0.0000
15	40-A-C	1211.1020	-0.1180	0.0370	-0.0610	1.7040	0.113	8.34295	11.4900	4.7400	15.5400		3.6900	0.0000	0.0000
16	40-A-C	1212.1170	-0.0970	0.0430	-0.0330	1.7050	0.109	8.41190	11.3400	4.7000	14.2400		3.9600	0.0000	0.0000
17	40-A-C	3101.1240	-0.1800	-0.1190	-0.4800	1.7190	0.140	8.96350	13.1100	5.4200	18.2000	21.7000	3.9000	0.0000	0.0000
18	40-A-C	3103.0970	-0.3950	-0.2220	-1.1080	1.7270	0.260	8.27400	13.9500	5.8100	20.9000	26.3000	3.9900	0.0000	0.0000
19	40-A-C	3112.1260	-0.2200	-0.1320	-0.5490	1.7200	0.240	8.96350	13.4700	5.5700	18.5000	17.7000	4.0000	0.0000	0.0000
20	40-A-C	3201.1110	-0.3120	-0.2100	-1.0300	1.7200	0.210	8.34295	13.3000	5.5000	19.6000	20.0000	3.6000	0.0000	0.0000
21	40-A-C	3203.2060	-0.1900	-0.1190	-0.4960	1.7060	0.170	8.96350	12.9900	5.4400	18.2000	18.4000	4.2100	0.0000	0.0000
22	40-A-C	3204.1250	-0.1950	-0.1210	-0.4970	1.7210	0.190	8.96350	13.3300	5.5500	18.4000	18.4000	4.2000	0.0000	0.0000
23	40-A-C	3205.2070	-0.2380	-0.1330	-0.5770	1.7080	0.210	8.96350	13.2100	5.5300	18.6000	19.2000	4.3500	0.0000	0.0000
24	40-A-C	3208.0870	-0.5350	-0.2930	-1.3470	1.7300	0.350	8.48085	14.3500	6.0400	20.9000	21.3000	4.0000	0.0000	0.0000
25	40-A-C	3210.1150	-0.5220	-0.2830	-1.4270	1.7410	0.370	8.54980	14.4900	5.9900	19.9000	20.4000	3.9900	0.0000	0.0000
26	40-A-C	3211.1020	-0.4650	-0.2530	-1.2950	1.7250	0.370	8.34295	14.2200	5.9300	20.5000	21.2000	4.1400	0.0000	0.0000
27	40-A-C	3212.1170	-0.4000	-0.2210	-1.1340	1.7210	0.350	8.41190	13.9800	5.8300	20.6000	20.8000	3.8900	0.0000	0.0000
28	40-A-C	5101.1240	-0.3130	-0.1900	-0.7860	1.7240	0.230	8.96350	15.8500	7.0300	21.1000	28.2000	3.9900	0.0000	0.0000
29	40-A-C	5103.0970	-0.7100	-0.4190	-1.7130	1.7380	0.370	8.41190	16.7300	6.6100	23.0000	30.4000	4.3300	0.0000	0.0000

Observation	Graphite	Specimen	Length (%)	Diameter (%)	Volume (%)	Density (g/cm^3)	Fluence (>50 keV)	Unirradiated Sonic Young's Modulus (GPa)	Irradiated Sonic Young's Modulus (GPa)	Irradiated Sonic Shear Modulus (GPa)	Resistivity Side (μOhm.m)	Resistivity Ends (μOhm.m)	CTE (500) ($°C^{-1}$ 10^{-6})	Axial Creep (%)	Axial Creep (%/esu)
30	40-A-C	5104.1120	-0.2470	-0.1070	-0.3270	1.7270	0.200	8.61875	16.9600	6.5700	21.3000	26.8000	3.9300	0.0000	0.0000
31	40-A-C	5105.0990	-0.2600	-0.1860	-0.9350	1.7170	0.230	8.34295	15.2100	6.2300	22.8000	29.1000	4.2900	0.0000	0.0000
32	40-A-C	5106.0660	-0.3220	-0.1650	-0.7390	1.7170	0.270	8.69455	16.9700	6.7000	22.2000	29.1000	4.6400	0.0000	0.0000
33	40-A-C	5110.1140	-0.3200	-0.1510	-0.6950	1.7290	0.270	8.48085	16.0800	6.7400	21.9000	21.0000	4.9300	0.0000	0.0000
34	40-A-C	5111.1010	-0.2900	-0.1290	-0.5500	1.7120	0.270	8.34295	16.1000	6.4400	22.3000	22.7000	4.8400	0.0000	0.0000
35	40-A-C	5112.1260	0.0000	0.0000	0.0000	1.7310	0.490	8.96350	16.3900	6.3100	22.1000	21.4000	4.1100	0.0000	0.0000
36	40-A-C	5201.1110	-0.5220	-0.4610	-1.6530	1.7230	0.300	8.34295	14.8200	6.0500	22.5000	22.6000	3.9900	0.0000	0.0000
37	40-A-C	5203.2060	-0.4700	-0.2500	-1.1170	1.7160	0.280	8.96350	14.2200	5.8400	21.3000	22.4000	4.0400	0.0000	0.0000
38	40-A-C	5204.1250	-0.4830	-0.2830	-1.1650	1.7320	0.310	8.96350	14.6400	5.9900	21.3000	21.3000	3.9800	0.0000	0.0000
39	40-A-C	5205.2070	-0.5780	-0.3290	-1.3660	1.7220	0.341	8.96350	14.5400	5.9900	21.8000	22.2000	4.0400	0.0000	0.0000
40	40-A-C	5206.0870	-1.0690	-0.5960	-2.3830	1.7470	0.520	8.48085	15.7500	6.4400	22.8000	23.5000	3.8300	0.0000	0.0000
41	40-A-C	5210.1150	-0.9950	-0.5680	-2.3630	1.7610	0.530	8.54980	16.1600	6.6300	22.3000	19.3000	3.9600	0.0000	0.0000
42	40-A-C	5211.1020	-0.8950	-0.5030	-2.1280	1.7390	0.520	8.34295	15.7700	6.5100	22.9000	23.2000	4.1900	0.0000	0.0000
43	40-A-C	5212.1170	-0.7670	-0.4430	-1.8570	1.7360	0.500	8.41190	15.1500	6.2000	23.0000	23.4000	4.5500	0.0000	0.0000
44	40-A-2	1301.0460	-0.6530	0.1500	-0.3600	1.7140	0.064	8.20505	10.3900	4.6700	15.8000	15.9000	4.5900	-0.5630	-0.0408
45	40-A-2	1303.0340	-0.7070	0.1970	-0.3310	1.7130	0.080	8.27400	11.2500	4.7300	17.3000	17.5000	4.5400	-0.6220	-0.0451
46	40-A-2	1305.0360	-0.7400	0.2060	-0.3460	1.7120	0.095	8.20505	11.3200	4.7900	17.6000	18.2000	4.5300	-0.6150	-0.0446
47	40-A-2	1308.0230	-0.8020	0.2000	-0.4180	1.7230	0.113	8.61675	11.8900	4.9600	18.2000	18.2000	4.5600	-0.6870	-0.0498
48	40-A-2	1311.0360	-0.7800	0.1860	-0.4340	1.7140	0.113	8.27400	11.3700	0.2243	17.5000	18.0000	4.5400	-0.6600	-0.0479
49	40-A-2	3301.0460	-1.4500	0.2030	-1.0970	1.7270	0.210	8.20505	13.5000	5.6600	~5.20	20.8000	4.3900	-1.1400	-0.0827
50	40-A-2	3303.0340	-1.7000	0.2460	-1.2600	1.7230	0.170	8.27400	13.3000	5.5100	20.5000	20.4000	4.6500	-1.3000	-0.0943
51	40-A-2	3305.1720	-1.3940	0.2170	-1.0070	1.7300	0.310	8.82560	13.1800	5.6600	19.2000	21.4000	4.5100	-1.1540	-0.0837
52	40-A-2	3308.0230	-2.0020	0.2470	-1.5660	1.7420	0.360	8.61875	13.9100	5.8100	20.0000	20.3000	4.5000	-1.4620	-0.1060
53	40-A-2	3311.0380	-1.9000	0.2040	-1.5620	1.7340	0.370	8.27400	13.0500	5.3400	21.1000	20.1000	4.9700	-1.4300	-0.1037
54	40-A-2	3403.1710	-1.3610	0.1940	-1.0360	1.7190	0.170	8.62560	11.4200	4.5100	19.1000	23.4000	4.9200	-1.1710	-0.0849
55	40-A-2	3405.1730	-1.4960	0.1790	-1.1570	1.7240	0.210	8.82560	11.7000	4.6700	19.8000	20.0000	4.3500	-1.2560	-0.0911
56	40-A-2	5301.0460	-2.0700	0.1010	-1.9790	1.7420	0.230	8.2005	14.8900	6.2200	22.7000	22.4000	4.7400	-1.5500	-0.1124
57	40-A-2	5303.0340	-2.4570	0.1330	-2.3300	1.7470	0.3700	8.2740	15.3300	6.4400	23.6000	23.0000	4.9500	-1.7470	-0.1267
58	40-A-2	5305.1720	-2.3350	0.1280	-2.1910	1.7380	0.3400	8.8256	14.4600	6.0500	23.2000	22.7000	5.0000	-1.7450	-0.1265
59	40-A-2	5308.0230	-2.9970	0.0430	-3.0860	1.7690	0.5200	8.6188	16.1300	6.7600	23.9000	23.1000	5.1000	-1.9270	-0.1397

Observation	Graphite	Specimen	Length (%)	Diameter (%)	Volume (%)	Density (g/cm^3)	Fluence (>50 keV)	Unirradiated Sonic Young's Modulus (GPa)	Irradiated Sonic Young's Modulus (GPa)	Irradiated Sonic Shear Modulus (GPa)	Resistivity Side (μOhm.m)	Resistivity Ends (μOhm.m)	CTE (500) ($^oC^{-1}$ 10^{-6})	Axial Creep (%)	Axial Creep (%/esu)
60	40-A-2	5311.0380	-2.7910	0.0720	-2.8130	1.7550	0.5200	8.2740	15.4800	6.4400	23.5000	23.2000	5.2900	-1.8910	-0.1371
61	40-A-2	5403.1710	-2.1900	0.1070	-2.0820	1.7360	0.2800	8.8256	14.1300	5.8800	22.3000	22.2000	4.8900	-1.7200	-0.1247
62	40-A-2	5405.1730	-2.6030	0.0580	-2.5810	1.7480	0.3400	8.8256	14.6200	6.1100	23.0000	22.7000	4.8300	-2.0130	-0.1460
63	40-A-3	1304.0490	-0.9960	0.2170	-0.5990	1.7350	0.0850	8.4809	11.8200	5.0700	17.5000	18.5000	4.5700	-0.8960	-0.0433
64	40-A-3	1310.0510	-1.0870	0.2240	-0.6780	1.7340	0.1150	8.4809	11.8400	5.0000	18.1000	19.1000	4.7100	-0.9400	-0.0454
65	40-A-3	1312.0530	-1.0200	0.2140	-0.6210	1.7310	0.1090	8.4809	11.5200	4.9200	17.1000	18.2000	4.3500	-0.9050	-0.0438
66	40-A-3	3304.0610	-1.7920	0.4280	-1.0130	1.7360	0.1900	8.8256	12.9800	5.5300	19.8000	22.0000	5.1000	-1.5970	-0.0772
67	40-A-3	3310.0510	-2.6990	0.4690	-1.8220	1.7540	0.3700	8.4809	13.8800	5.9400	21.9000	19.5000	5.4500	-2.2900	-0.1107
68	40-A-3	3312.0530	-2.3950	0.4430	-1.5520	1.7480	0.3500	8.4809	13.1000	5.4100	21.5000	19.7000	5.3200	-1.9950	-0.0965
69	40-A-3	3404.0620	-1.9420	0.4490	-1.1410	1.7380	0.1900	8.8946	11.8100	4.7300	20.5000	24.7000	5.1400	-1.7470	-0.0645
70	40-A-3	5304.0610	-2.9220	0.3520	-2.3900	1.7590	0.3100	8.8256	14.6000	6.2500	23.9000	23.0000	5.5900	-2.4420	-0.1161
71	40-A-3	5310.0510	-3.8840	0.3040	-3.5290	1.7830	0.5300	8.4809	16.2700	6.9200	25.5000	24.0000	5.8000	-2.8840	-0.1394
72	40-A-3	5312.0530	-3.4420	0.3210	-3.0070	1.7550	0.5000	8.4809	15.8000	6.7000	25.2000	23.8000	5.6600	-2.7720	-0.1340
73	40-A-3	5404.0620	-3.2560	0.3210	-2.8200	1.7660	0.3100	8.8946	14.9000	6.3800	25.2000	23.0000	5.3600	-2.7760	-0.1342
74	40-R-C	1109.0910	-0.0770	0.0170	-0.0570	1.6990	0.1160	7.6535	10.3200	4.4700	16.2900		4.6800	0.0000	0.0000
75	40-R-C	1209.0920	-0.0650	0.0220	-0.0390	1.7040	0.1160	7.5845	10.5200	4.5400	19.7600		4.5100	0.0000	0.0000
76	40-R-C	3109.0950	-0.1700	-0.2400	-0.7280	1.7120	0.2600	7.6535	11.7300	5.0100	20.7000	23.7000	4.7000	0.0000	0.0000
77	40-R-C	3209.0920	-0.3350	-0.3570	-1.4760	1.7230	0.3700	7.5845	12.5600	5.3700	21.5000	19.9000	4.6500	0..000	0.0000
78	40-R-C	5109.0950	-0.4100	-0.5670	-1.7120	1.7280	0.4200	7.6535	13.3300	5.6000	24.1000	29.1000	4.4100	0..000	0..00000
79	40-R-C	5209.0920	-0.6780	-0.7090	-2.3410	1.7430	0.5300	7.5845	14.3200	6.1300	23.9000	21.9000	4.4500	0.0000	0.0000
80	40-R-2	1309.0280	-0.8500	0.1830	-0.5020	1.7130	0.1160	7.5845	10.5700	4.6300	16.5000	17.5000	5.1900	-0.7600	-0.0566
81	40-R-2	3309.0280	-2.0870	0.1510	-1.8470	1.7370	0.3700	7.5845	12.2500	5.1700	21.8000	20.9000	5.5600	-1.7470	*-0.1267*
82	40-R-2	5309.0280	-2.9770	-0.0170	-3.1870	1.7590	0.5300	7.5845	14.6000	6.2800	24.5000	22.2000	6.1600	-2.2970	-0.1666
83	41-A-C	1106.0760	-0.0800	0.0210	-0.0520	1.7130	0.1010	8.3430	11.7700	4.8400	16.3500		3.7800	0.0000	0.0000
84	41-A-C	1206.0770	-0.0970	0.0010	-0.1140	1.7120	0.1010	8.4119	11.7500	4.9000	15.3600		3.7900	0.0000	0.0000
85	41-A-C	3106.0800	-0.3670	-0.1110	-0.8040	1.7060	0.2250	8.8946	13.1500	5.3700	19.9000	24.7000	3.9500	0..000	0.0000
86	41-A-C	3206.0760	-0.4400	-0.3300	-1.1400	1.7310	0.2100	8.3430	14.2100	5.6600	20.3000	21.1000	4.2000	0.0000	0.0000
87	41-A-C	5106.0800	-0.7110	-0.3750	-1.6280	1.7200	0.3600	8.8940	*16.2900*	*6.3700*	23.6000	30.6000	4.1600	0.0000	0.0000
88	41-A-C	5206.0760	-0.8000	-0.5930	-2.1990	1.7500	0.3600	8.3430	15.7000	6.3800	22.2000	22.8000	3.6000	0.0000	0.0000
89	41-A-2	1306.0130	-0.7850	0.2000	-0.3990	1.7120	0.1010	8.6188	11.7000	4.9800	17.3000	17.6000	4.5200	-0. 700	-0.0508

Observation	Graphite	Specimen	Length (%)	Diameter (%)	Volume (%)	Density (g/cm^3)	Fluence (>50 keV)	Unirradiated Sonic Young's Modulus (GPa)	Irradiated Sonic Young's Modulus (GPa)	Irradiated Sonic Shear Modulus (GPa)	Resistivity Side (μOhm.m)	Resistivity Ends (μOhm.m)	CTE (500) ($°C^{-1}$ 10^{-6})	Axial Creep (%)	Axial Creep (%/esu)
90	41-A-2	3306.0130	-1.9430	0.2360	-1.5210	1.7390	0.3300	8.6188	14.1500	5.9800	20.6000	20.4000	4.5900	-1.5030	-0.1070
91	41-A-2	5306.0130	-2.8430	0.0280	-2.8750	1.7620	0.4600	8.6188	15.8600	6.6300	23.9000	22.8000	4.9300	-2.0880	*-0.1514*
92	41-A2-C	1107.0810	-0.0950	0.0390	-0.0340	1.7280	0.1110	8.8946	12.2500	5.0800	*16.0500*		3.6600	0.0000	0.0000
93	41-A2-C	1207.0820	-0.0900	0.0190	-0.0690	1.7260	0.1110	8.6877	12.3000	5.1100	15.7700		3.7300	0.0000	0.0000
94	41-A2-C	3107.0850	-0.2515	-0.1680	-3.7030	1.7300	0.2400	8.3430	14.2100	5.9200	16.6000	23.7000	*3.9000*	0.0000	0.0000
95	41-A2-C	3207.0820	-0.4410	-0.2820	-1.3460	1.7440	0.3500	8.6877	14.9600	6.2000	19.7000	20.3000	4.1500	0.0000	0.0000
96	41-A2-C	5107.0850	-0.5980	-0.3790	-1.4930	1.7440	0.3900	8.3430	17.2400	6.8000	22.3000	29.1000	3.8800	0.0000	0.0000
97	41-A2-C	5207.0820	-0.8950	-0.5540	-2.2240	1.7630	0.5000	8.6877	16.7700	6.9100	21.9000	22.2000	3.8100	0.0000	0.0000
98	41-A2-2	1307.0180	-0.6870	0.1960	-0.3080	1.7390	0.1110	8.9635	12.6200	5.2700	19.7000	17.4000	4.5900	-0.5970	-0.0433
99	41-A2-2	3307.0180	-1.7600	0.2170	0.0000	1.7560	0.3500	8.9635	14.7700	6.1700	19.7000	20.9000	4.7900	-1.3100	-0.0950
100	41-A2-2	5307.0180	-2.6720	0.0360	-2.7280	1.7800	0.5000	8.9635	17.1900	7.2600	22.5000	22.1000	4.8000	-1.7720	-0.1265
101	3-A-C	1102.0680	-0.1820	0.0010	-0.2160	1.7680	0.0720	12.1352	10.7200	4.2800	10.6300		1.5700	0.0000	0.0000
102	3-A-C	1202.0660	-0.1450	0.0400	-0.0900	1.7730	0.0720	12.2731	11.8300	4.9900	8.4200		1.9000	0.0000	0.0000
103	3-A-C	3102.0690	-0.2720	-0.1390	-0.6290	1.7730	0.1600	12.8937	17.6600	7.3600	16.9000	26.6000	1.7500	0.0000	0.0000
104	3-A-C	3202.0660	-0.4820	-0.1790	-1.0490	1.7880	0.2300	12.1352	17.9900	7.2200	16.5000	23.2000	2.1500	0.0000	0.0000
105	3-A-C	5102.0690	-0.2820	-0.2260	-0.7550	1.7750	0.2600	12.8937	17.5100	6.6800	20.9000	34.9000	1.7900	0.0000	0.0000
106	3-A-C	5202.0660	-0.7970	-0.2780	-1.4950	1.7980	0.3300	12.1352	14.5700	5.3200	20.7000	27.9000	1.6000	0.0000	0.0000
107	3-A-2	1302.0050	-0.6000	0.1110	-0.3920	1.7760	0.0720	11.9284	11.0100	4.5700	15.4000	18.8000	1.8800	-0.4500	-0.0326
108	3-A-2	3302.0050	-1.3570	0.1210	-1.1290	1.7900	0.2300	11.9284	15.7600	6.3900	15.7000	16.4000	2.5000	-0.8770	-0.0636
109	3-A-2	5302.0050	-1.9590	0.0820	-1.8560	1.8020	0.3300	11.9284	18.8900	7.3500	21.3000	25.6000	2.6500	-1. 159	-0.0841
110	3-A-2	1113.0070	-0.0650	0.0610	-0.0530	1.7600	0.0970	5.8608	6.8200	3.4300	21.1300		3.3600	0.0000	0.0000
111	3-A-2	1213.0710	-0.0430	0.0540	-0.0490	1.7700	0.0970	5.8608	8.2180	3.4600	18.6300		3.4100	0.0000	0.0000
112	3-A-2	3113.0740	-0.1350	-0.1370	-0.4770	1.7720	0.2100	5.8608	10.5200	7.4600	18.9000	15.6000		0.0000	0.0000
113	3-R-C	3213.0710	-0.2230	-0.2290	-0.9550	1.7850	0.2900	5.8608	8.5200	.	22.8000	17.4000	3.5600	0.0000	0.0000
114	3-R-C	5113.0740	-0.2450	-0.3040	-0.9720	1.7810	0.3300	8.3430	10.3800	4.2800	22.9000	22.7000	3.7100	0.0000	0.0000
115	3-R-C	5213.0710	-0.3750	-0.5300	-1.5810	1.7990	0.4100	5.8608	11.0200	4.5500	22.5000	19.7000	3.5500	0.0000	0.0000
116	3-R-2	1313.0070	-1.1100	0.1600	-0.8130	1.7750	0.0970	7.1708	6.4570	3.8100	16.4000	15.9000	4.2400	-1.0550	-0.0765
117	3-R-2	3313.0070	-2.0170	0.1540	-1.7430	1.7920	0.2900	7.1708	9.7900	6.7100	23.3000	21.9000	5.0700	-1.7970	-0.1303

Table 4: 900°C OC Experiments – Mobasheran Data (Mobasheran, 1990)

Observation	Graphite	Specimen	Length (%)	Diameter (%)	Volume (%)	Density (g/cm^3)	Fluence (>50 keV)	Unirradiated Sonic Young's Modulus (GPa)	Irradiated Sonic Young's Modulus (GPa)	Irradiated Sonic Shear Modulus (GPa)	Resistivity Side (μOhm.m)	Resistivity Ends (μOhm.m)	CTE (500) ($^{o}C^{-1}$ 10^{-6})	Axial Creep (%)	Axial Creep (%/esu)
1	40-AX-CON	2101.107	-0.068	-0.082	-0.269	1.7058	0.095		15.70	6.48	21.00	23.40	3.65	0	0
2	40-AX-CON	2201.108	-0.078	-0.092	-0.291	1.7069	0.095		15.77	6.50	21.20	23.00	3.55	0	0
3	40-AX-CON	2103.103	-0.12	-0.125	-0.407	1.712	0.152		16.20	6.69	22.20	23.90	3.72	0	0
4	40-AX-CON	2203.104	-0.13	-0.117	-0.398	1.7128	0.152		16.11	6.66	21.90	23.60	3.65	0	0
5	40-AX-CON	2104.118	-0.133	-0.15	-0.475	1.7099	0.177		16.09	6.64	23.00	24.20	3.83	0	0
6	40-AX-CON	2204.119	-0.15	-0.15	-0.495	1.7119	0.177		16.08	6.65	23.50	24.00	3.87	0	0
7	40-AX-CON	2112.122	-0.168	-0.164	-0.54	1.7226	0.206		16.64	6.88	22.20	23.80	3.86	0	0
8	40-AX-CON	2212.123	-0.268	-0.175	-0.677	1.726	0.206		15.49	6.16	22.50	24.30	3.67	0	0
9	40-AX-CON	2205.106	-0.183	-0.176	-0.59	1.7144	0.199		16.30	6.74	22.00	24.60	3.62	0	0
10	40-AX-CON	2105.105	-0.163	-0.16	-0.529	1.7131	0.199		16.44	6.80	22.80	24.40	3.86	0	0
11	40-AX-CON	2111.090	-0.182	-0.187	-0.609	1.7135	0.225		16.27	6.71	22.50	24.90	3.71	0	0
12	40-AX-CON	2211.110	-0.133	-0.201	-0.587	1.712	0.225		16.43	6.82	24.90	24.90	3.52	0	0
13	40-AX-CON	2110.120	-0.203	-0.193	-0.645	1.7134	0.237		16.24	6.69	23.20	24.80	3.61	0	0
14	40-AX-CON	2210.121	-0.225	-0.212	-0.715	1.7129	0.237		16.35	6.80	23.20	25.30	3.70	0	0
15	40-AX-CON	2108.088	-0.205	-0.205	-0.672	1.7141	0.239		16.55	6.82	22.90	24.90	3.60	0	0
16	40-AX-CON	2208.089	-0.235	-0.215	-0.735	1.7164	0.239		16.52	6.83	23.40	25.30	3.60	0	0
17	40-AX-CON	4201.108	-0.198	-0.221	-0.727	1.7143	0.261		17.62	7.52	23.70	25.70	3.60	0	0
18	40-AX-CON	4101.107	-0.228	-0.226	-0.776	1.7146	0.261		17.58	7.53	24.00	26.20	3.15	0	0
19	40-AX-CON	4203.104	-0.245	-0.33	-1.011	1.7233	0.363		18.16	7.78	24.00	26.00	3.42	0	0
20	40-AX-CON	4103.103	-0.348	-0.318	-1.098	1.7238	0.363		18.19	7.79	24.50	26.50	3.06	0	0
21	40-AX-CON	4104.118	-0.433	-0.379	-1.319	1.7243	0.408		18.18	7.82	25.30	26.80	3.35	0	0
22	40-AX-CON	4204.119	-0.405	-0.384	-1.308	1.7258	0.408		18.09	7.68	23.50	27.10	3.52	0	0
23	40-AX-CON	4112.122	-0.47	-0.379	-1.355	1.7366	0.438		18.77	8.10	23.60	26.20	3.36	0	0
24	40-AX-CON	4212.123	-0.47	-0.417	-1.451	1.7393	0.438		18.98	8.11	23.90	26.40	3.32	0	0
25	40-AX-CON	4205.106	-0.468	-0.438	-1.499	1.7299	0.446		18.52	7.92	24.30	26.90	3.40	0	0
26	40-AX-CON	4105.105	-0.475	-0.409	-1.435	1.7285	0.446		18.29	7.81	24.30	26.50	3.33	0	0
27	40-AX-CON	4111.090	-0.512	-0.444	-1.552	1.7296	0.477		18.36	7.92	23.70	27.30	3.94	0	0
28	40-AX-CON	4211.110	-0.503	-0.474	-1.616	1.7295	0.477		18.36	8.00	25.40	27.10	3.55	0	0
29	40-AX-CON	4210.121	-0.528	-0.504	-1.711	1.7298	0.502		18.71	8.03	24.60	27.30	3.97	0	0

Observation	Graphite	Specimen	Length (%)	Diameter (%)	Volume (%)	Density (g/cm^3)	Fluence (>50 keV)	Unirradiated Sonic Young's Modulus (GPa)	Irradiated Sonic Young's Modulus (GPa)	Irradiated Sonic Shear Modulus (GPa)	Resistivity Side (μOhm.m)	Resistivity Ends (μOhm.m)	CTE (500) ($^oC^{-1}$ 10^{-6})	Axial Creep (%)	Axial Creep (%/esu)
30	40-AX-CON	4110.120	-0.543	-0.465	-1.634	1.7302	0.502		18.31	7.81	24.00	26.90	3.68	0	0
31	40-AX-CON	4108.088	-0.59	-0.53	-1.74	1.7323	0.512		18.45	7.86	25.00	26.90	3.68	0	0
32	40-AX-CON	4208.089	-0.573	-0.53	-1.812	1.7347	0.512		18.94	8.10	23.60	27.70	3.60	0	0
33	40-AX-2	2301.044	-0.71	0.065	-0.595	1.7158	0.095		15.29	6.30	18.60	23.00	4.30	-0.637	-0.0462
34	40-AX-2	2401.045	-0.68	0.065	-0.574	1.7141	0.095		15.52	6.46	21.60	23.20	4.28	-0.607	-0.04402
35	40-AX-2	2303.040	-0.83	0.049	-0.76	1.7212	0.152		15.95	6.65	24.20	23.30	4.50	-0.705	-0.05113
36	40-AX-2	2403.041	-0.82	0.049	-0.71	1.7199	0.152		16.00	6.65	24.20	23.60	4.07	-0.695	-0.0504
37	40-AX-2	2305.042	-0.95	0.042	-0.889	1.7229	0.199		16.14	6.74	25.10	23.90	4.56	-0.777	-0.05635
38	40-AX-2	2405.043	-0.96	0.033	-0.916	1.7244	0.199		16.28	6.81	24.20	23.80	4.20	-0.787	-0.05707
39	40-AX-2	2411.047	-1.06	0.024	-1.04	1.7219	0.225		16.30	6.87	27.20	24.60	4.73	-0.902	-0.06541
40	40-AX-2	2311.027	-1.01	0.035	-0.962	1.7259	0.225		16.40	6.88	24.90	24.10	4.08	-0.852	-0.06179
41	40-AX-2	2408.026	-1.05	0.021	-1.033	1.7259	0.239		16.56	6.93	26.00	24.40	4.12	-0.83	-0.06019
42	40-AX-2	2308.025	-1.05	0.019	-1.042	1.7241	0.239		16.43	6.86	26.40	24.30	4.68	-0.83	-0.06019
43	40-AX-2	4301.044	-1.18	0.017	-1.231	1.7266	0.261		17.14	7.33	25.10	25.40	4.79	-0.967	-0.07013
44	40-AX-2	4401.045	-1.17	-0.033	-1.287	1.7262	0.261		17.26	7.43	25.10	25.70	4.51	-0.957	-0.0694
45	40-AX-2	4403.041	-1.43	-0.079	-1.659	1.7361	0.363		18.03	7.88	24.40	25.90	4.13	-1.082	-0.07847
46	40-AX-2	4303.040	-1.425	-0.072	-1.561	1.7349	0.363		17.62	7.51	24.70	25.80	3.95	-1.077	-0.0781
47	40-AX-2	4405.043	-1.69	-0.136	-2	1.7429	0.446		18.26	7.87	24.80	25.80	4.33	-1.218	-0.08833
48	40-AX-2	4305.042	-1.66	-0.125	-1.987	1.7416	0.446		18.13	7.98	25.00	26.00	4.00	-1.188	-0.08615
49	40-AX-2	4311.027	-1.68	-0.135	-2.038	1.7443	0.477		18.37	7.91	25.80	26.20	4.59	-1.172	-0.08499
50	40-AX-2	4411.047	-1.78	-0.147	-2.162	1.7411	0.477		18.49	8.09	25.50	26.60	4.35	-1.272	-0.09225
51	40-AX-2	4408.026	-1.86	-0.185	-2.33	1.748	0.512		18.38	7.93	24.60	26.10	3.93	-1.279	-0.09275
52	40-AX-2	4308.025	-1.76	-0.176	-2.209	1.744	0.512		18.56	8.14	25.60	26.30	4.68	-1.179	-0.0855
53	40-AX-3	2404.056	-1.28	0.144	-1.027	1.7327	0.177		15.76	6.61	24.10	25.40	4.93	-1.139	-0.05507
54	40-AX-3	2304.055	-1.35	0.139	-1.132	1.7334	0.177		15.83	6.69	23.60	25.70	4.87	-1.209	-0.05785
55	40-AX-3	2312.059	-1.34	0.104	-1.095	1.7354	0.206		16.13	6.82	25.90	24.90	3.58	-1.172	-0.05667
56	40-AX-3	2412.060	-1.39	0.114	-1.206	1.7411	0.206		16.24	6.86	24.60	25.20	4.78	-1.222	-0.05908
57	40-AX-3	2410.058	-1.55	0.131	-1.335	1.7362	0.237		16.01	6.79	24.70	26.00	4.75	-1.336	-0.06459
58	40-AX-3	2310.057	-1.53	0.111	-1.364	1.7374	0.237		16.04	6.80	24.90	25.90	4.87	-1.316	-0.06363
59	40-AX-3	4304.055	-2.15	0.008	-2.238	1.7523	0.408		17.96	7.95	25.90	27.40	4.66	-1.731	-0.08369

Observation	Graphite	Specimen	Length (%)	Diameter (%)	Volume (%)	Density (g/cm^3)	Fluence (>50 keV)	Unirradiated Sonic Young's Modulus (GPa)	Irradiated Sonic Young's Modulus (GPa)	Irradiated Sonic Shear Modulus (GPa)	Resistivity Side (μOhm.m)	Resistivity Ends (μOhm.m)	CTE (500) ($^{o}C^{-1}$ 10^{-6})	Axial Creep (%)	Axial Creep (%/esu)
60	40-AX-3	4404.056	-2.19	0.029	-2.234	1.7534	0.408		17.70	7.80	25.80	27.20	4.95	-1.771	-0.08563
61	40-AX-3	4412.060	-2.24	-0.003	-2.371	1.7612	0.438		18.28	8.06	26.40	27.40	4.94	-1.77	-0.08558
62	40-AX-3	4312.059	-2.14	-0.027	-2.222	1.7547	0.438		17.79	7.96	26.70	26.90	5.08	-1.67	-0.08074
63	40-AX-3	4410.058	-2.54	-0.024	-2.724	1.76	0.502		17.88	7.95	26.20	27.70	4.93	-2.005	-0.09694
64	40-AX-3	4310.057	-2.4	-0.039	-2.065	1.7587	0.502		17.89	7.91	26.20	27.80	5.06	-1.865	-0.09017
65	40-RA-CON	2209.094	-0.192	-0.236	-0.73	1.7086	0.241		14.91	6.38	26.10	24.30	4.37		
66	40-RA-CON	2109.093	-0.175	-0.225	-0.681	1.7094	0.241		14.93	6.36	26.70	24.00	4.20		
67	40-RA-CON	4109.093	-0.505	-0.523	-1.722	1.7271	0.513		16.95	7.47	24.70	27.80	4.25		
68	40-RA-CON	4209.094	-0.462	-0.544	-1.729	1.7255	0.513				25.10	27.80	4.26		
69	40-RA-2	2409.031	-1.24	-0.006	-1.285	1.7251	0.241		14.80	6.48	27.40	24.10	5.13	-1.057	-0.07665
70	40-RA-2	2309.030	-1.18	0.018	-1.182	1.7235	0.241		14.87	6.51	28.90	23.50	5.24	-0.997	-0.0723
71	40-RA-2	4309.030	-1.9	-0.169	-2.336	1.7431	0.513				25.30	27.90	5.27	-1.417	-0.10276
72	40-RA-2	4409.031	-2.02	-0.193	-2.526	1.7463	0.513		16.00		25.50	26.90	5.00	-1.537	-0.11146
73	41-AX-CON	2106.078	-0.18	-0.161	-0.551	1.7101	0.217		16.61	6.86	23.00	24.70	3.81		
74	41-AX-CON	2206.079	-0.195	-0.186	-0.622	1.7084	0.217		16.49	6.82	22.90	24.40	3.65		
75	41-AX-CON	4206.079	-0.47	-0.464	-1.553	1.7242	0.477		18.68	7.97	24.80	26.80	3.74		
76	41-AX-CON	4106.078	-0.512	-0.433	-1.535	1.7268	0.477		18.47	7.84	24.20	27.10	3.50		
77	41-AX-2	2306.015	-0.99	0.022	-0.973	1.7256	0.217		16.40	6.84	24.70	24.00	4.50	-0.803	-0.05823
78	41-AX-2	2406.016	-0.98	0.031	-0.944	1.7224	0.217		16.34	6.82	25.00	23.80	4.45	-0.793	-0.05751
79	41-AX-2	4306.015	-1.65	-0.154	-1.944	1.7422	0.477		18.51	8.02	25.40	26.10	4.61	-1.158	-0.08398
80	41-AX-2	4406.016	-1.74	-0.136	-2.102	1.7422	0.477		18.25	8.94	25.10	25.70	4.49	-1.248	-0.0905
81	41-AX2-CON	2207.084	-0.205	-0.197	-0.657	1.7331	0.23		17.50	7.30	21.40	23.80	3.55		
82	41-AX2-CON	2107.083	-0.185	-0.189	-0.629	1.7317	0.23		17.45	7.21	22.50	23.30	3.72		
83	41-AX2-CON	4207.084	-0.439	-0.498	-1.644	1.7501	0.499		19.82	8.51	24.00	25.30	3.70		
84	41-AX2-CON	4107.083	-0.53	-0.462	-1.601	1.7484	0.499		18.86	7.89	24.00	25.10	3.26		
85	41-AX2-2	2307.020	-0.94	0.015	-0.938	1.741	0.23		17.36	7.26	23.50	23.00	4.57	-0.745	-0.05403
86	41-AX2-2	2407.021	-0.96	0.007	-0.969	1.7438	0.23		17.44	7.30	23.60	23.20	4.01	-0.765	-0.05548
87	41-AX2-2	4407.021	-1.68	-0.176	-2.111	1.7636	0.499		19.22	8.27	24.10	25.00	3.94	-1.195	-0.08666
88	41-AX2-2	4307.021	-1.6	-0.174	-2.022	1.7597	0.499		18.99	8.52	24.80	25.00	4.31	-1.115	-0.08086
89	327-AX-CON	2102.065	-0.098	-0.087	-0.301	1.7691	0.125		14.47	5.31	16.70	27.90	1.26		

Observation	Graphite	Specimen	Length (%)	Diameter (%)	Volume (%)	Density (g/cm^3)	Fluence (>50 keV)	Unirradiated Sonic Young's Modulus (GPa)	Irradiated Sonic Young's Modulus (GPa)	Irradiated Sonic Shear Modulus (GPa)	Resistivity Side (μOhm.m)	Resistivity Ends (μOhm.m)	CTE (500) ($^{o}C^{-1}$ 10^{-6})	Axial Creep (%)	Axial Creep (%/esu)
90	327-AX-CON	2202.067	-0.075	-0.087	-0.275	1.7732	0.125		18.89	7.35	16.70	27.90	1.68		
91	327-AX-CON	4202.067	-0.31	-0.271	-0.729	1.7812	0.314		22.05	8.58	17.70	32.90	1.31		
92	327-AX-CON	4102.065	-0.305	-0.265	-0.921	1.78	0.314		23.22	9.17	17.80	33.30	0.96		
93	327-AX-2	2402.004	-0.63	0.039	-0.567	1.7772	0.125		18.98	7.52	18.00	27.70	1.85	-0.543	-0.03938
94	327-AX-2	2302.002	-0.68	0.043	-0.607	1.7779	0.125		22.20	8.84	18.60	27.00	2.00	-0.593	-0.043
95	327-AX-2	4402.004	-1.18	-0.076	-1.374	1.7914	0.314		21.36	9.31	18.80	30.70	1.75	-0.873	-0.06331
96	327-AX-2	4302.002	-1.2	-0.075	-1.385	1.7916	0.314		23.24	9.44	19.10	29.60	1.57	-0.893	-0.06476
97	327-RA-CON	2213.073	-0.128	-0.05	-0.513	1.7655	0.177		12.37	5.67	32.30	24.90	3.08		
98	327-RA-CON	2113.072	-0.112	-0.05	-0.43	1.7703	0.177		11.27	5.67	32.30	25.20	3.21		
99	327-RA-CON	2113.072	-0.112	-0.133	-0.43	1.7703	0.177		11.27	5.67	32.30	25.20	3.21		
100	327-RA-CON	2213.073	-0.128	-0.1	-0.513	1.7655	0.177		12.37	5.67	32.30	24.90	3.08		
101	327-RA-CON	4113.072	-0.355	-0.433	-1.235	1.7845	0.382		13.66	7.36	21.40	29.20	2.87		
102	327-RA-CON	4113.072	-0.355	-0.3	-1.235	1.7845	0.382		13.66	7.36	21.40	29.20	2.87		
103	327-RA-CON	4213.073	-0.33	-0.355	-1.26	1.7786	0.382		13.92	7.48	19.10	31.10	2.59		
104	327-RA-CON	4213.073	-0.33	-0.48	-1.26	1.7786	0.382		13.92	7.48	19.10	31.10	2.59		
105	327-RA-2	2413.010	-1.35	-0.133	-1.415	1.7936	0.177		11.72	4.95	18.90	25.50	4.00	-1.23	-0.0892
106	327-RA-2	2313.009	-1.36	-0.133	-1.446	1.803	0.177		12.20	5.28	19.20	24.50	4.28	-1.24	-0.08992
107	327-RA-2	2313.009	-1.36	0.017	-1.446	1.803	0.177		12.20	5.28	19.20	24.50	4.28	-1.24	-0.08992
108	327-RA-2	2413.010	-1.35	0.117	-1.415	1.7936	0.177		11.72	4.95	18.90	25.50	4.00	-1.23	-0.0892
109	327-RA-2	4313.009	-1.96	-0.267	-2.141	1.8153	0.382		13.26	5.62	19.50	30.60	4.30	-1.618	-0.11734
110	327-RA-2	4313.009	-1.96	0.117	-2.141	1.8153	0.382		13.26	5.62	19.50	30.60	4.30	-1.618	-0.11734
111	327-RA-2	4413.010	-2.14	0.1	-2.388	1.8109	0.382		13.33	9.37	20.30	30.00	4.25	-1.798	-0.13039
112	327-RA-2	4413.010	-2.14	-0.267	-2.388	1.8109	0.382		13.33	9.37	20.30	30.00	4.25	-1.798	-0.13039

Table 5: 600°C OC Experiments – Mobasheran Data (Mobasheran, 1990)

The OC-Series archive at ORNL was interrogated and a number of important documents were recovered. Three types of documents were recovered and these are summarised in Table 6.

	900°C			
	Pre	**OC1**	**OC3**	**OC5**
CPO	No	Yes	Yes	Yes
Datasheet	Yes	Yes	Part	No
Extension	No	Yes	Yes	No
	600°C			
	Pre	**OC2**	**OC4**	
CPO	No	Yes	Yes	
Datasheet	No	No	No	
Extension	No	Yes	Yes	

Table 6: Important Documents recovered from ORNL OC-Series Archive

Firstly, computer database printouts (CPO) for both the 900°C and 600°C experiments were discovered. The data from the 900°C series of experiments is presented in Table 7. The data from 600°C series of experiments is presented in Table 8.

It should be noted that no hardcopy computer printout was uncovered for the pre-characterization of either series of experiments. However hand written datasheets for the 900°C series of experiments were discovered which contained some pre-characterization data. Due to the format this data is presented as a series of tabular sheets in Appendix A.

The computer printouts were compared electronically with the data tables obtained from the Ph.D. Thesis (Mobasheran, 1990). Following some corrections to the Ph.D. tables the datasets were self-consistent. The computer printouts provided some additional data such as annealed specimen data and Poisson's Ratio. Tables of hand written thermal expansion data were discovered for OC3, OC2 and OC4. These are presented in a series of Tables in Appendix B.

In addition, several data storage disks (3.5") have been found in the archive. It is anticipated that these disks could reveal additional data and any data manipulations that were carried out. However to date these disks have proved unreadable. ***It is recommended that efforts are continued to read these disks and uncover missing data.***

Analysis of Available Data

All data are plotted as a function of neutron fluence (10^{26} n/m^2 [E>50keV]).

900 ℃

Dimensional change

The dimensional change data, length and diameter have been calculated using engineering strain. The original dimensional change data were re-calculated using large strain formulation and as expected no significant difference was observed at these modest strains.

The direct and lateral dimensional change data at 900°C are presented in Figure 3 and 4. A little surprisingly there is some overlap in the different stressed datasets. This can in part, be explained by the overstressing of specimens in Column 4 during OC-1. The specimens could have been subjected to a considerable over stress for some period during the irradiation and this is reflected in the enhanced dimensional change over Column 3 specimens shown in Figures 3 and 4.

In Figure 4 the lateral data show little or no separation at low fluence which may highlight some concerns surrounding the lateral data – i.e. is the fluence correct? ***This should be investigated further***. ***It is also interesting to note that the higher stress in Column 4 could indicate earlier reduction in the rate of change of the lateral creep data although there is obviously very limited data. This requires further investigation.***

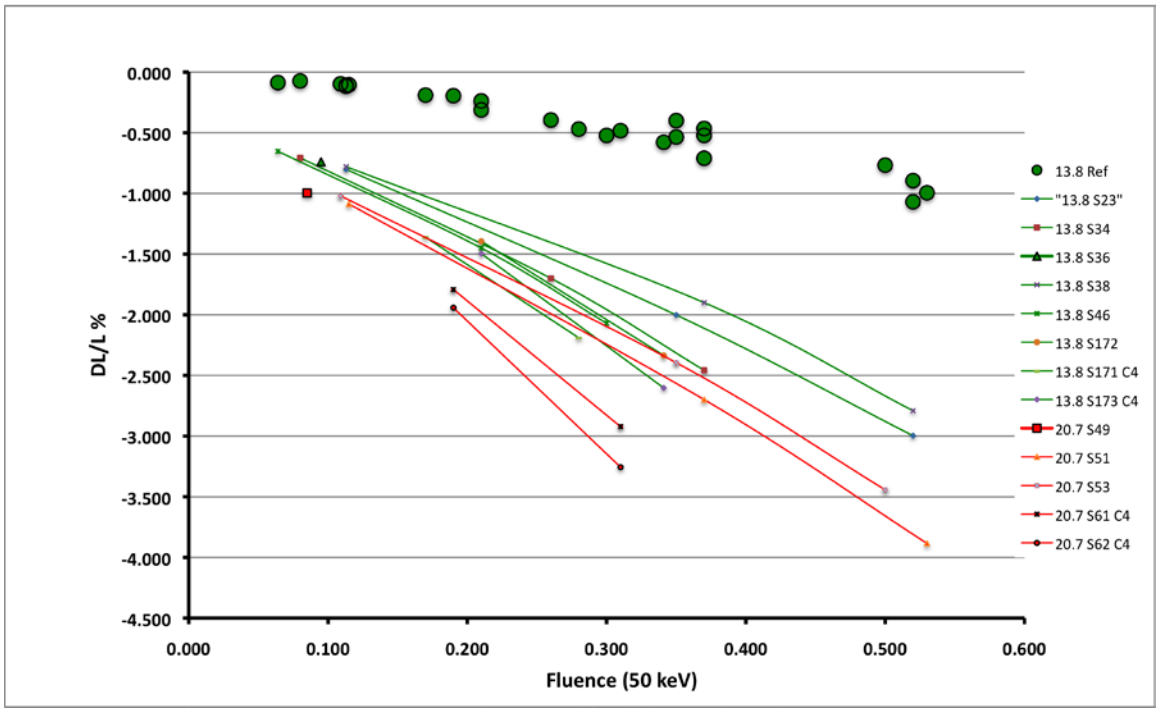


Figure 3: 900°C Direct Dimensional Change Data

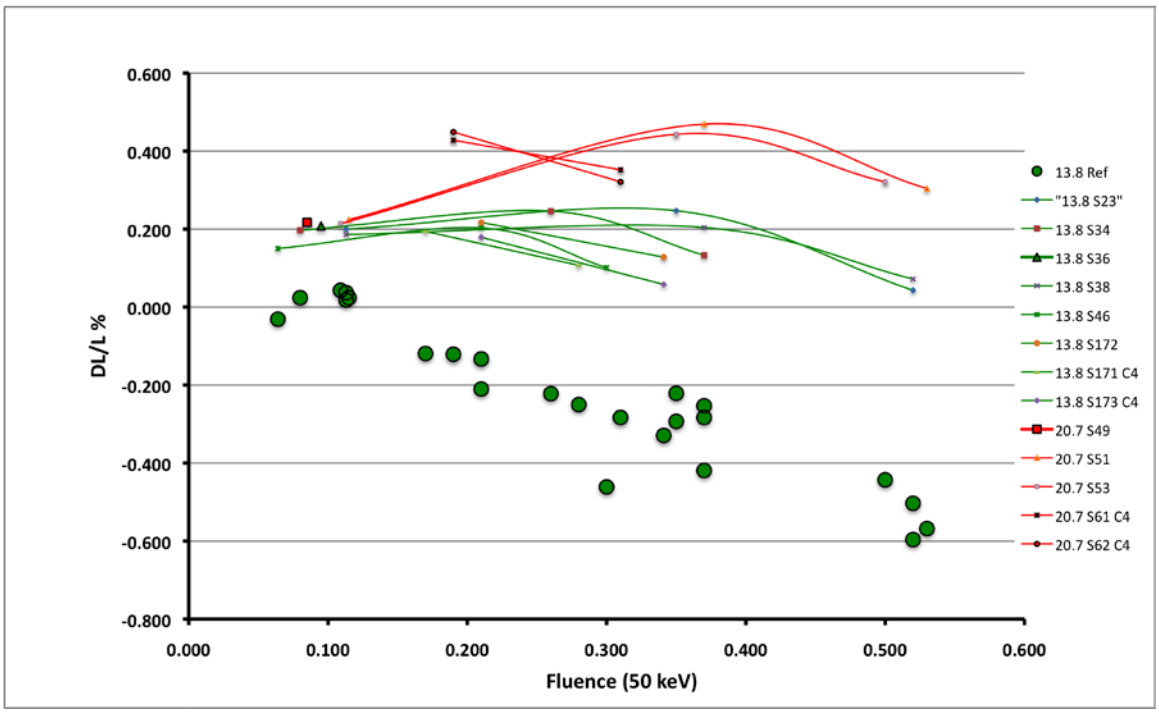


Figure 4: 900°C Lateral Dimensional Change Data

The volume data are shown in Figure 5 based on the diameter and length changes quoted above. However it should be noted that the original volume data quoted by Mobasheran (1990) included a correction due to the internal hole drilled in the reference specimens to allow thermal couple insertion and for the spacer holes drilled in the stressed specimens. This slight modification to volume change was required to determine the true density as it was used in the derivation of the Modulii via the density. The data are very scattered and it is difficult to draw any conclusions from the data.

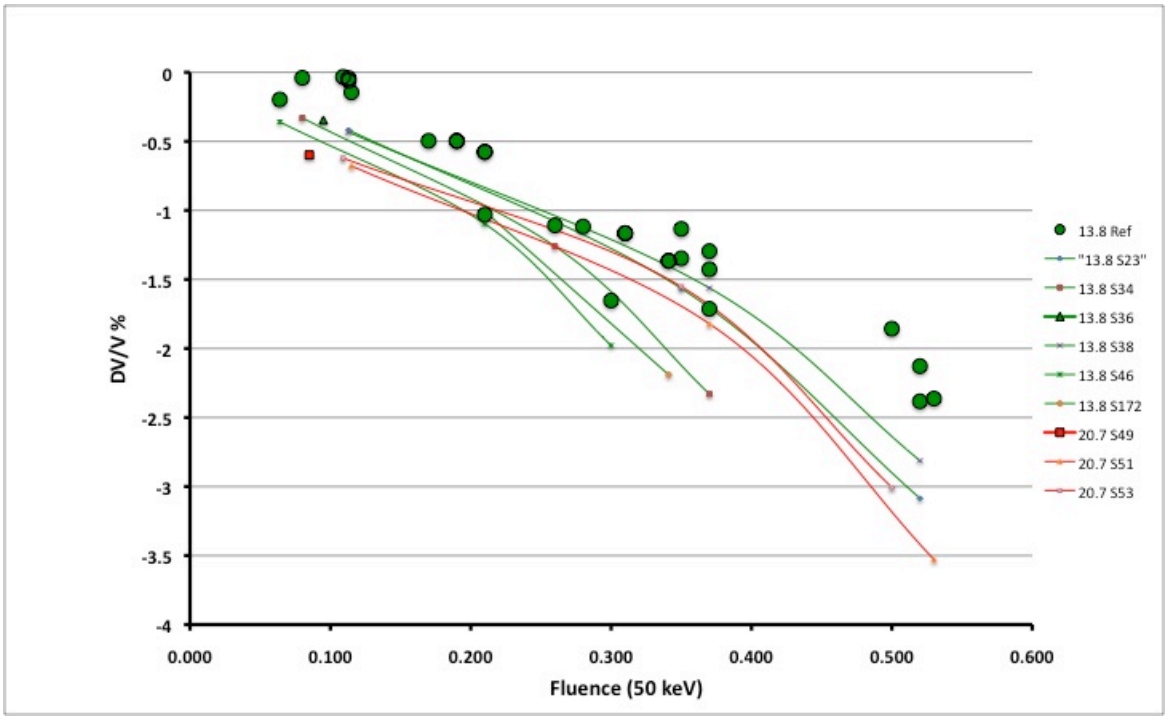


Figure 5: 900°C Volume Change Data

Irradiation Induced Creep

The quoted creep data has been derived by the difference between the stressed and reference specimens at the same position (axial height) within the column. No corrections appear to have been made to the measured data; however, it is not known which reference specimens were used in the original analysis. It was also observed that some difference in fluence at various positions throughout the capsules were observed between the reference and stressed specimens. ***This requires resolution, i.e. is there any significant difference at a given axial position?***

In this re-analysis Stressed Column 3 has been paired with Reference Column 1 and Stressed Column 4 has been paired with Reference Column 2. The creep strain has also been calculated assuming the German KFA correction for the changes in CTE and Modulus (See Appendix C). Apart from the very low fluences a modest correction (~2%) was applied to the measured data as a result of the KFA correction. Any lateral creep data has been presented without correction as there is insufficient data to make the corrections. The direct and lateral data are presented in Figures 6 and 7 and show the high creep strains predicted for the Column 4 data from OC-1. As a result of the uncertainty associated with these data they have not been considered further in this analysis but perhaps ***could be revisited in the future***.

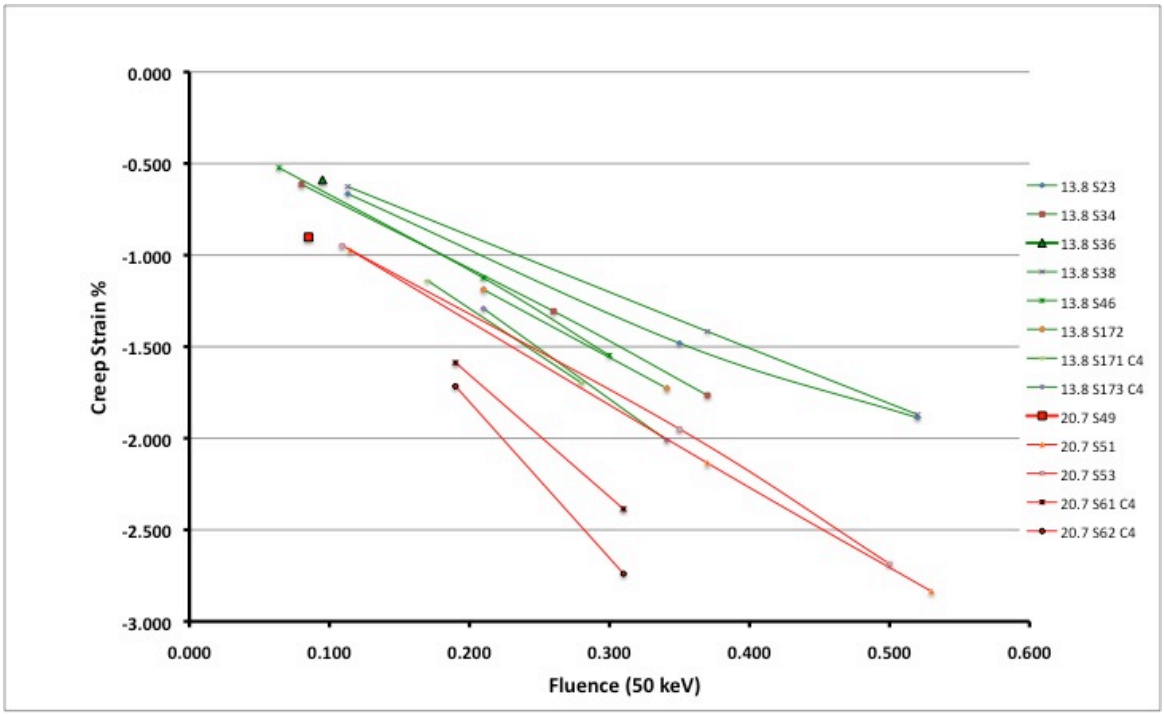


Figure 6: 900°C Direct Creep Data

In Figure 7 the lateral creep data show little or no separation at low fluence which may indicate little or no lateral creep for these specimens. It could also indicate that there could be some concerns surrounding the data i.e. is the fluence correct? ***Also shown in Figure 7 is the C4 data indicating that lateral creep has saturated earlier or at a lower level which would not be expected if the specimens were significantly overloaded. This requires further investigation.***

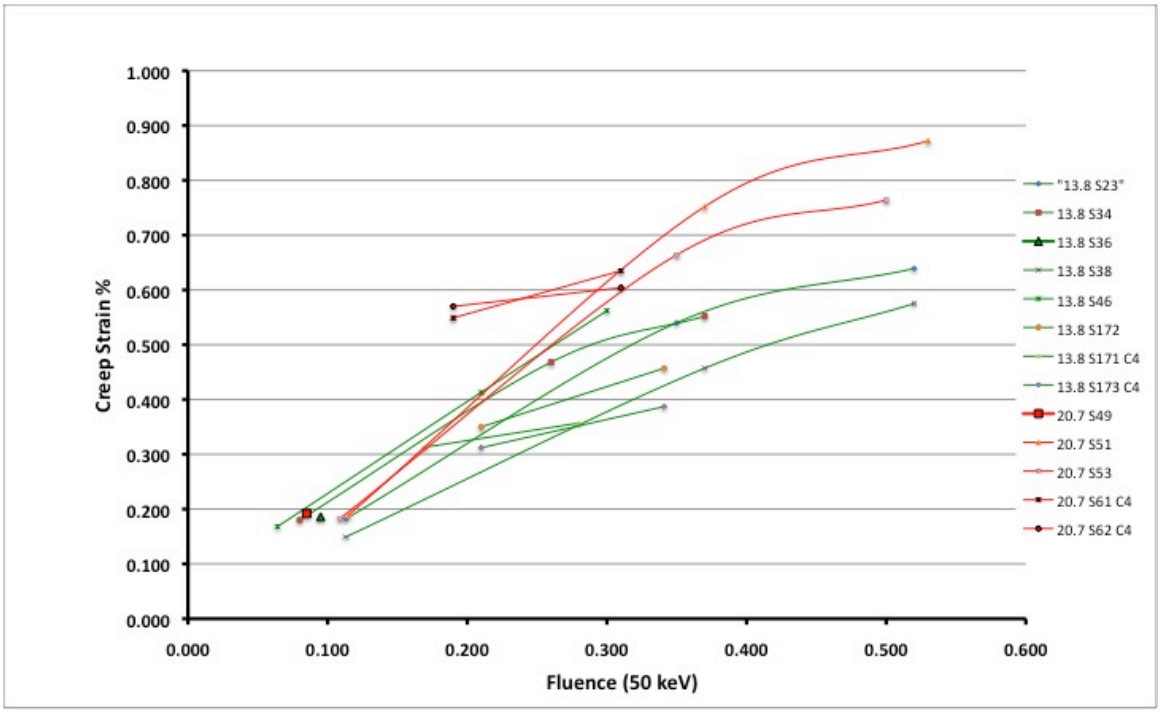


Figure 7: 900°C Lateral Creep Data

The direct creep data have been normalized by initial elastic strain and are expressed in %/esu (elastic strain units) as shown in Figure 8. The normalization has used the initial dynamic Modulus. The data shows that the higher stress data lie slightly below the lower stress values. It also shows considerable variation in the 13.8 MPa dataset. This may be due to the temperature variation exhibited in OC-1 at some axial positions in the Capsule. Also the UK assumes the initial Static Modulus is used which would affect the esu calculated and the correction applied. This may also reduce the scatter in the results. ***These issues may be resolved with further investigation.***

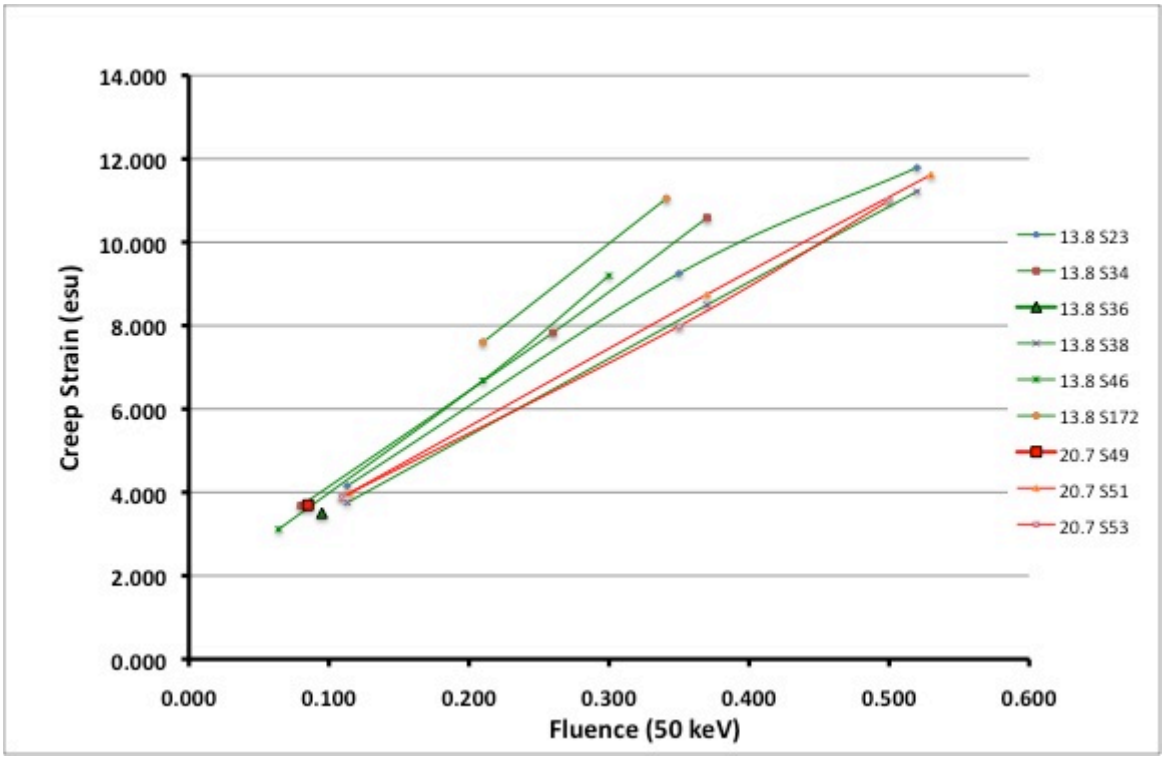


Figure 8: 900°C Normalized Direct Creep Data

Annealed Specimens

Five specimens that were irradiated under load in OC-1 were subsequently irradiated without load in OC-3, i.e. the crept specimens were annealed to recover primary creep. The length change results of the anneal experiment are shown in Figure 9 and Figure 10 shows the equivalent results for diameter change.

The figures clearly illustrate the total recovery of creep strain, in fact some of the annealed data exhibit considerable recovery beyond the reference data set. This "over recovery" has been observed in thermal annealing experiments of unstressed PGA graphite and has also been observed in UK unstressed experiments where specimens have been re-irradiated at different irradiation temperatures and overshoot in the dimensional change has been observed. ***This requires further consideration.***

Unfortunately, three of the five annealed specimens were loaded in column 4 of capsule OC-1 and were therefore subject to significant overload. As discussed earlier the data obtained from the column 4 specimens is somewhat uncertain and has been excluded from further consideration at this time. Therefore only two of the annealed specimens, one 13.8 MPa and one 20.7 MPa, were loaded in Column 3 of Capsule OC-1 and annealed in OC-3. Figure 11 compares the normalized creep strain from these specimens with the main H-451 dataset. The results are remarkable and show that approximately 4 esu are recovered substantially in excess of the 1 esu traditionally attributed to primary creep. (NB if UK static Modulus is used this drops to ~3.5 esu). ***It should be noted that these annealing results indicate there is apparently no secondary or "irrecoverable" creep established at these low fluences.***

Further work is required to investigate the overstressed specimens that were subsequently annealed. Efforts should be made to investigate the Disks for material property measurements of annealed samples.

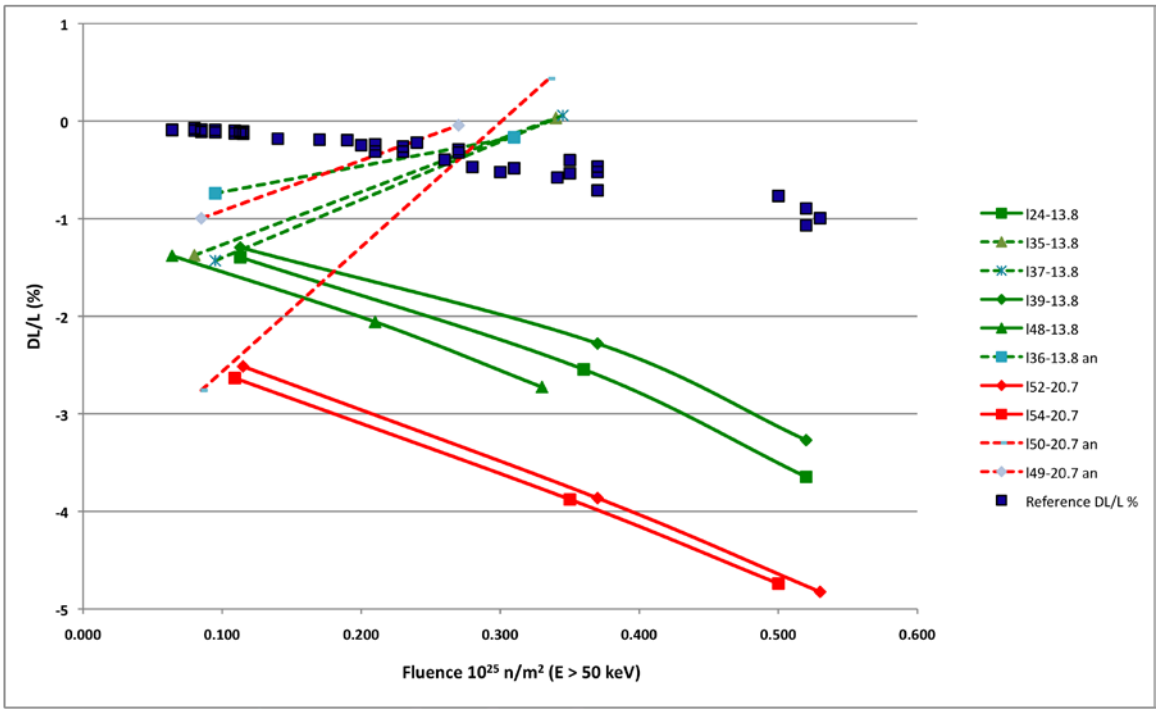


Figure 9: Direct Recovery of Annealed Specimens from OC-3

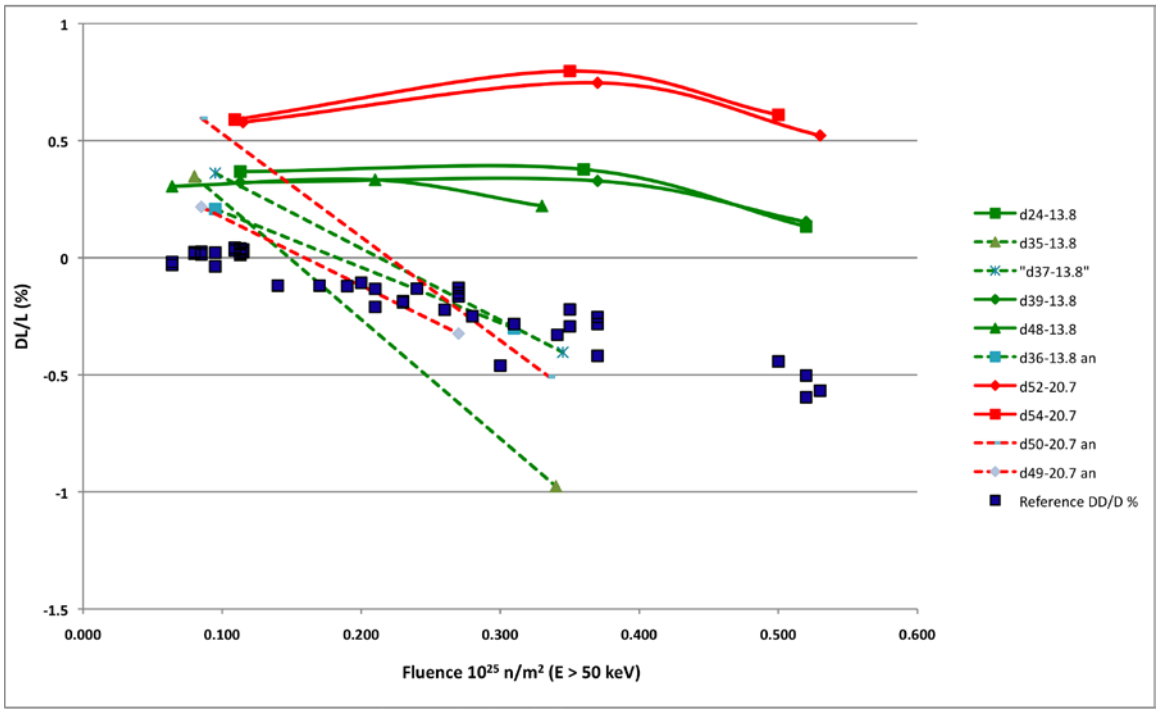


Figure 10: Lateral Recovery of Annealed Specimens from OC-3

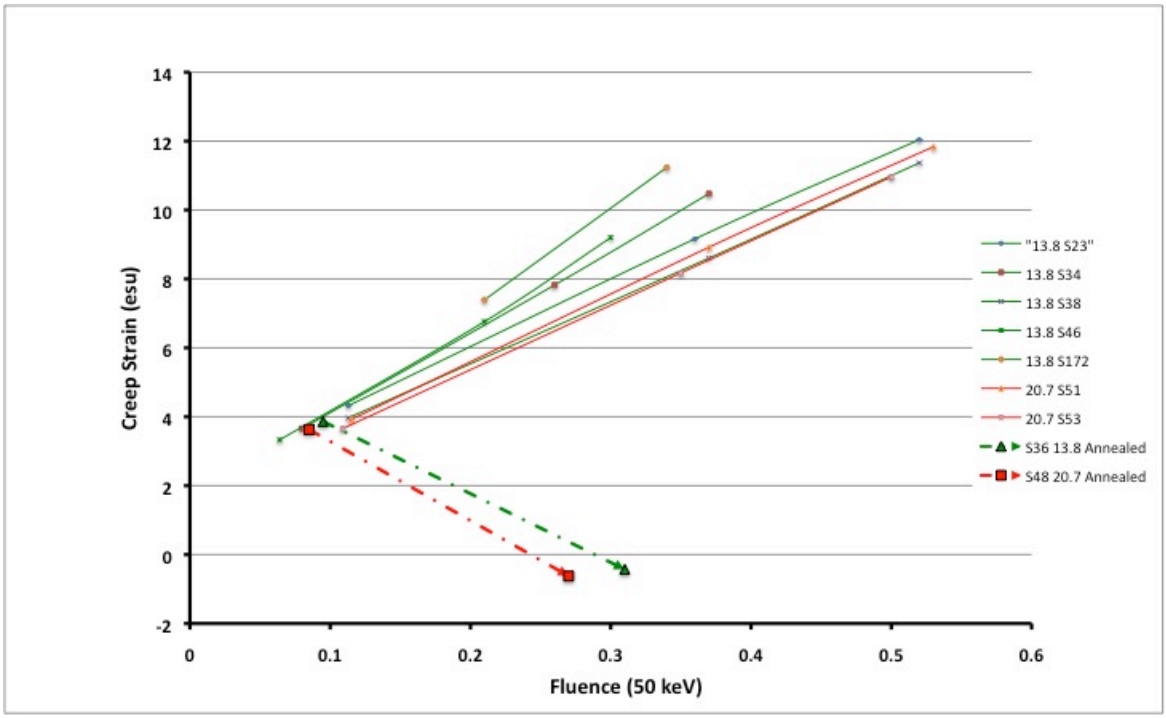


Figure 11: Normalized Direct Recovery of Annealed Specimens from OC-3

Modulus

The Irradiated Modulus data at 900°C are presented in Figure 12. The data are separated into Reference and Stressed specimens and appear to indicate no dependence of either Modulus on creep strain at these fluences.

From Figure 12 it would appear that the data are saturating towards the higher fluence. Figure 13 represents the data with the irradiation history of each sample shown and indicates that both Modulii are increasing possibly at a different rate to the reference samples. This is reinforced in Figure 14 where the data are evaluated as fractional change in Modulii and indicate a different behaviour. ***This requires further investigation.***

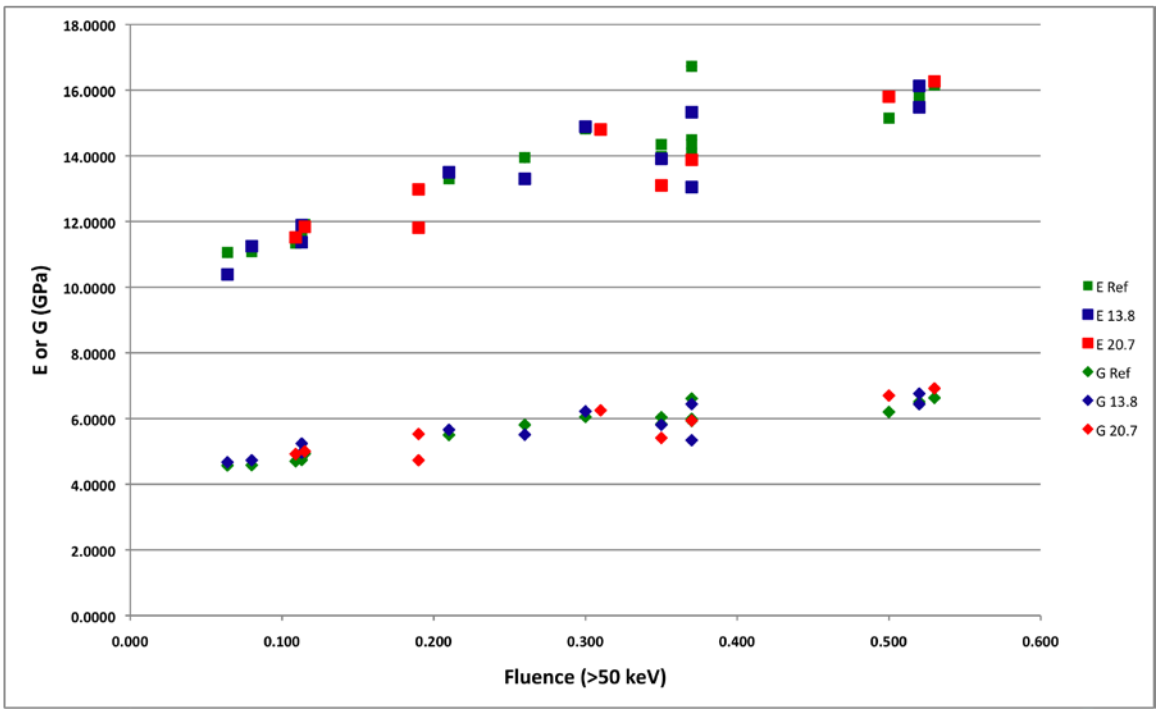
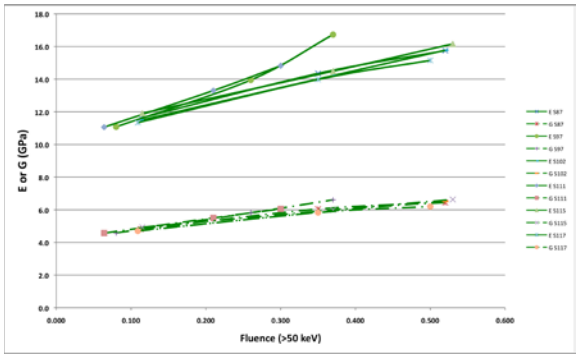
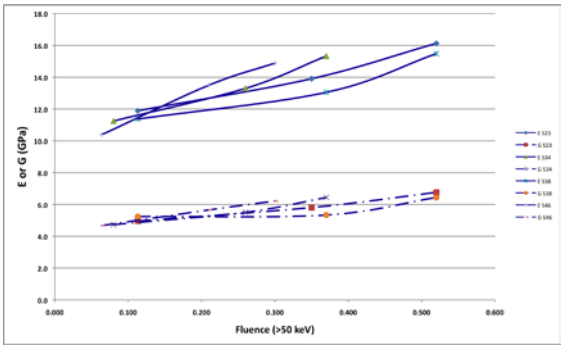


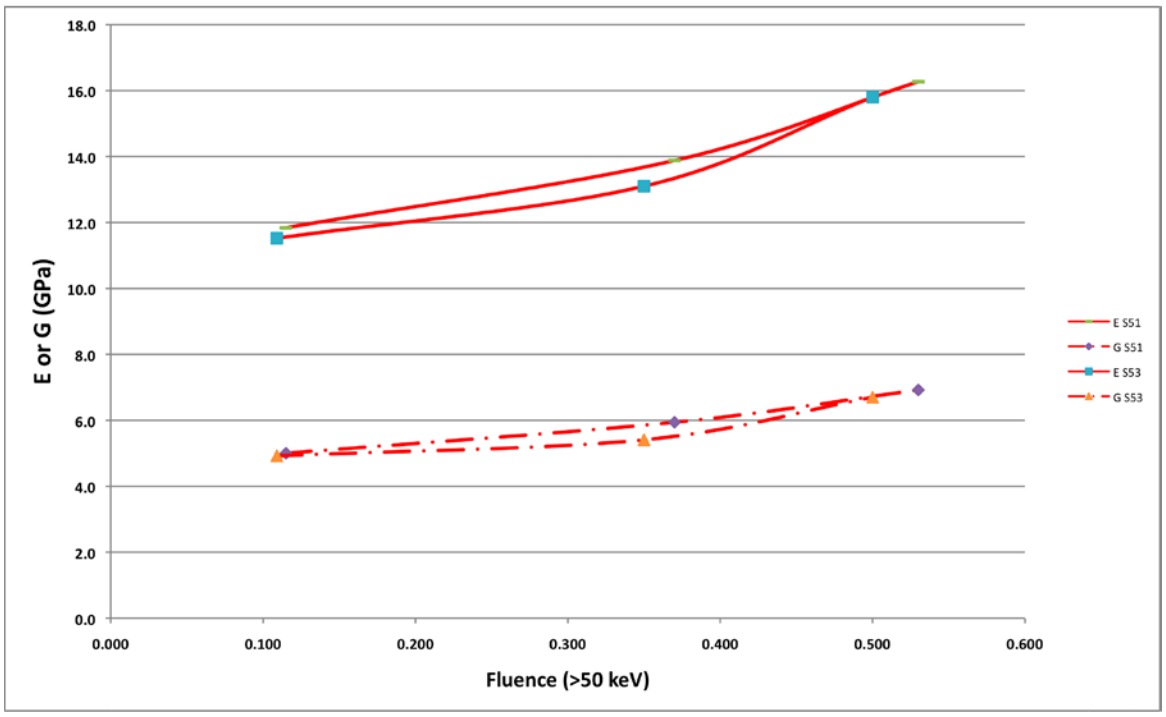
Figure 12: Young's and Shear Modulii at 900°C



a) Reference

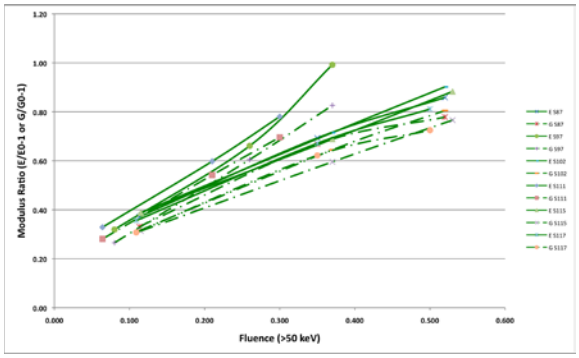


b) 13.8 MPa

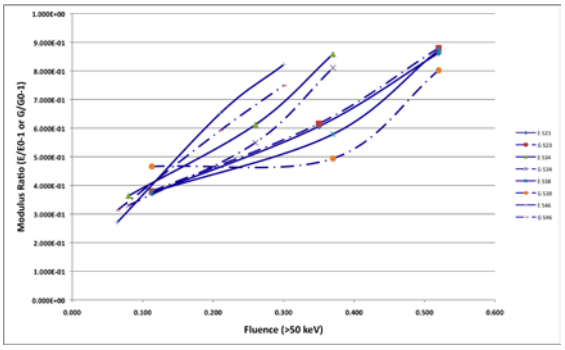


c) 20.7 MPa

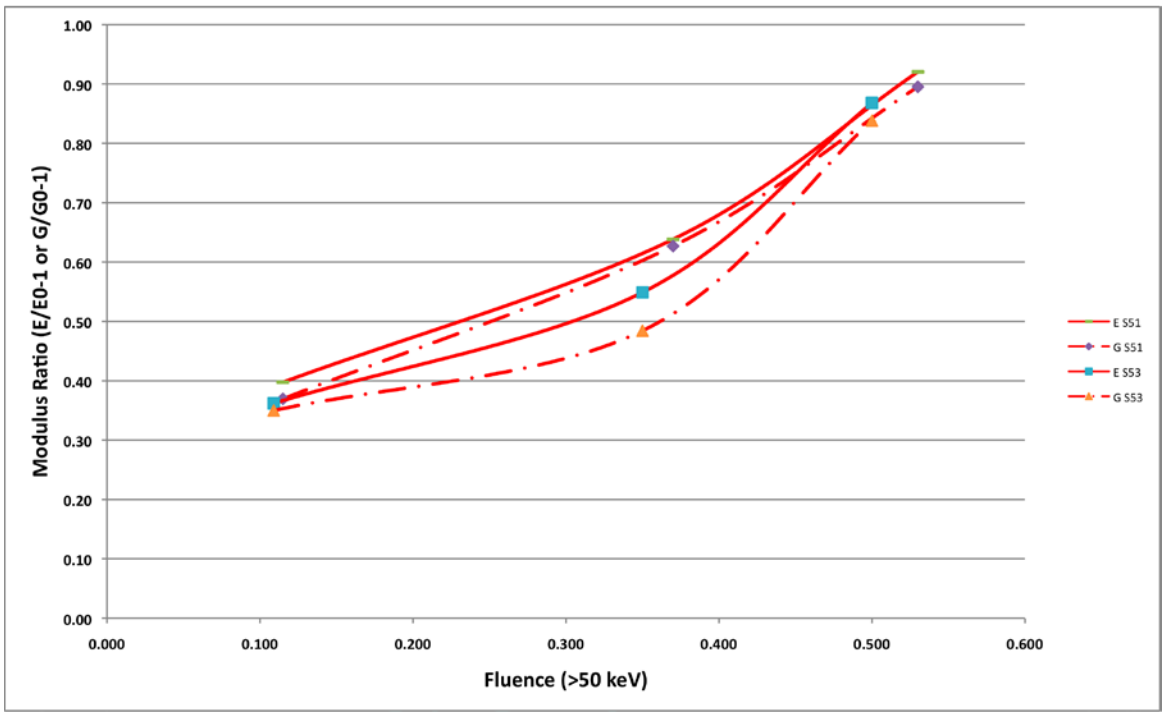
Figure 13: Young's and Shear Modulii at 900°C with specimen history



a) Reference



b) 13.8 MPa



c) 20.7 MPa

Figure 14: Fractional change of Modulii at 900°C with specimen history

Poisson's Ratio

There is limited Poisson's Ratio data reported in the computer print out which appears to be at odds with the data published in the ORNL annual report and the data presented by Kennedy et al (1977) where it was claimed that Poisson's ratio of H-451 was substantially reduced as a result of creep strain for H-451. The H-451 Kennedy et al (1977) data (900°C) are reported in Figure 15. The US data presented in the UKAEA review (Brocklehurst and Kelly, 1989) are shown in Figure 15 and 29.

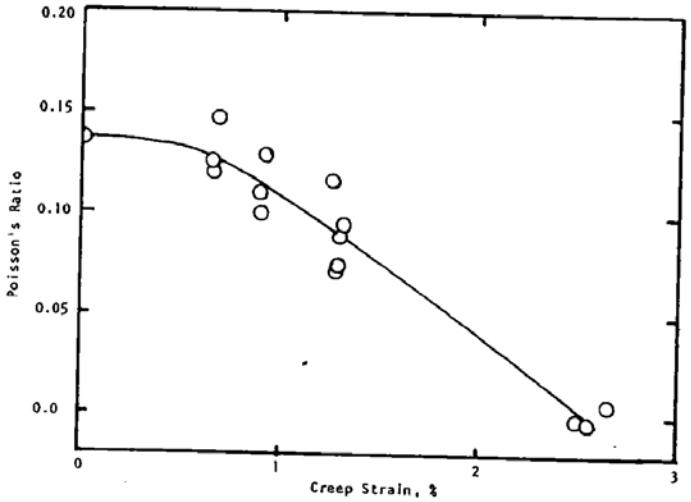


Figure 15: Effect of Creep strain on Poisson's ratio at 900°C (Kennedy et al, 1977)

It has been found that this graph has been mislabeled and is H-327 not H-451. ***The H-327 data presented in this Figure should be confirmed as this data is not contained within the computer printouts. Additional H-451 data may also be sourced from the computer disks.***

The H-451 unirradiated Poisson's ratio has been determined from quoted sonic velocities in the datasheets (Table 9) and this is presented in Figure 16 along with the quoted H-451 irradiated data (OC1 only). Apart from Specimen 23 the data all exhibit an increase of Poisson's ratio with irradiation and compressive creep strain in contrast to the data presented in Figure 15. ***This begs the question does tensile creep strain reduce Poisson's ratio.***

The increase in Poisson's ratio of the stressed data (Specimen 23 aside) may be slightly less than the reference data. Now that the unirradiated Poisson's ratio have been determined for the specimens it may be possible to determine irradiated Poisson's ratio without knowing the sonic velocities. ***This should be investigated further to provide additional information on Poisson's ratio at higher irradiation fluences and creep strains.***

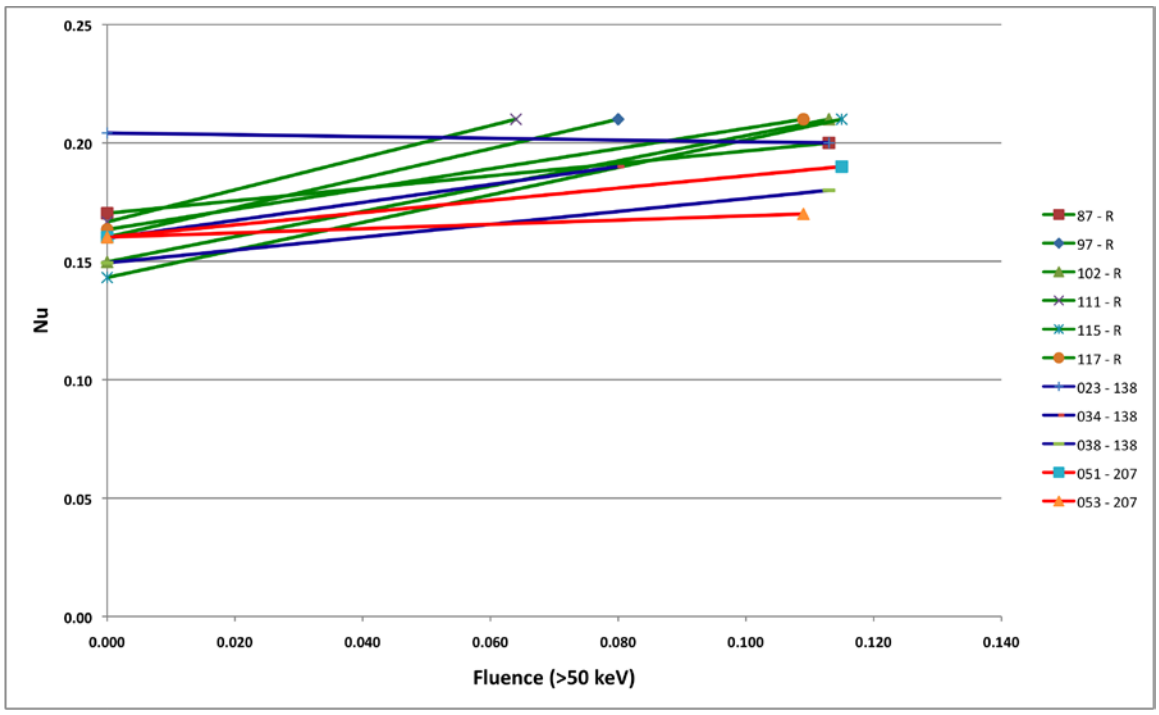


Figure 16: Effect of Creep strain on Poisson's ratio at 900°C

Coefficient of Thermal Expansion

Figure 17 shows the representation of the CTE dilatometer data from the OC-1, 3 and 5 series of experiments presented at the 1979 Carbon Conference (Kennedy and Eatherly, 1979). The dilatometer data has been evaluated by eye as a linear function of temperature with A the intercept (i.e. the mean CTE at 0°C) and B the slope. In Figure 17, A is

presented as A/A_0 which is believed to be ratio of the stressed CTE to the unstressed CTE and B is presented as the slope determined from the stressed specimen. This approach is considered questionable as the evaluation is subjective and the CTE data are non-linear.

Figure 17 shows that A/A_0 and B are relatively flat for all grades up to 2% creep strain and the previous interpretation of these results is significantly influenced by the creep strain values above 2%. These high creep strain values are believed to be specimens that were subject to a significant over load in column 4 during experiment OC-1 and as such the results may be misleading. ***This requires further investigation outside the scope of this report.***

Additionally, the unstressed value of B, i.e. at zero creep strain, estimated from the dilatometer data is approximately 2 E-9 K^{-2} which is higher than the trend line drawn in Figure 17. Therefore using the data as presented in Figure 17 and ignoring both the drawn trend line and the high strain values would tend to suggest that the temperature dependence of CTE is independent of creep strain for an irradiation temperature of 900°C.

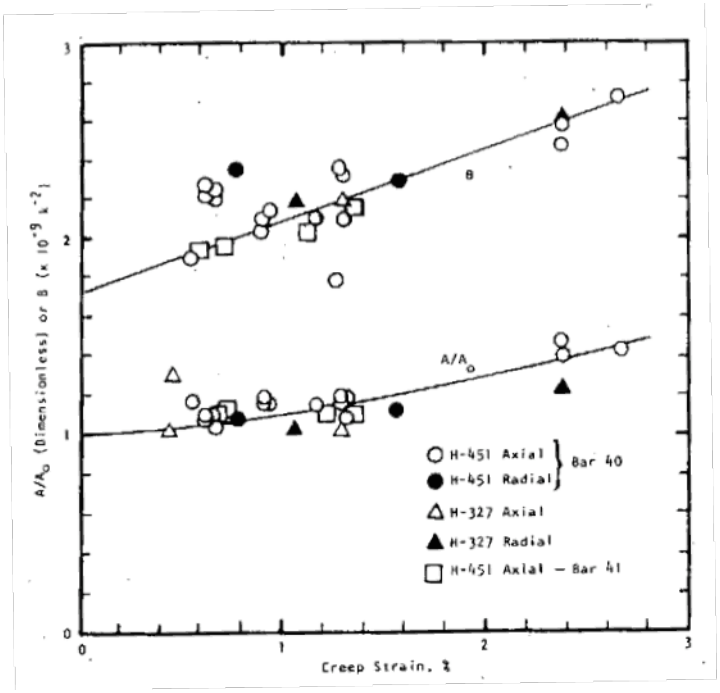


Figure 17: Effect of Creep Strain on the Mean Coefficient of thermal Expansion (α=A+BT) (Kennedy and Eatherly, 1977)

The dilatometer data from OC-1 and OC-3 have been re-assessed from the available extension data and are presented in Appendix A and Appendix B. The determination of the mean CTE at 800°C from the extension data were similar in trend to previously quoted values but systematically offset by 0.5E-6/°C. The systematic offset is be due to a the dilatometer measurement technique using quartz as the reference material. The CTE of Quartz is relatively temperature insensitive and this would lead to a fixed offset in the

determination of the graphite CTE. For the purposes of this reassessment a fixed CTE offset of 0.5E-6/°C has been included.

Figure 18 shows the pre-irradiated dilatometer data for H-451 specimens in the OC-1, OC-3 and OC-5 experiments. No post experiment data dilatometer data exists for experiment OC-5. The data indicate a significant variability in the mean CTE, which is consistent across the temperature range.

The UK developed a theory to derive the mean CTE at any temperature from the mean CTE over the 20°C to 120°C temperature range and the temperature dependence of the crystal CTEs, α_c and α_a up to the temperature of interest (Tsang/Marsden, CTE Science). The UK methodology assumes that any change in structure associated with CTE will manifest itself at the lower temperature range and the temperature dependence remains unaffected. Figure 18 shows that the body of pre-irradiated data can be well represented assuming the UK theoretical prediction of the temperature dependence of mean CTE (black dotted line).

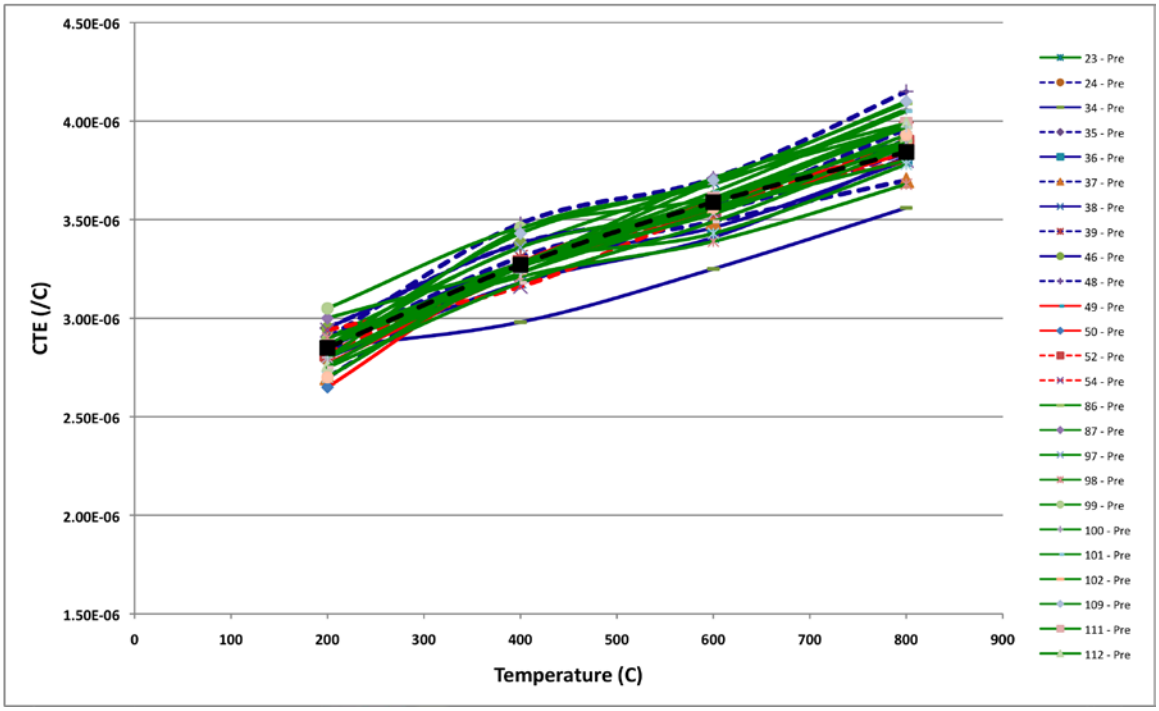
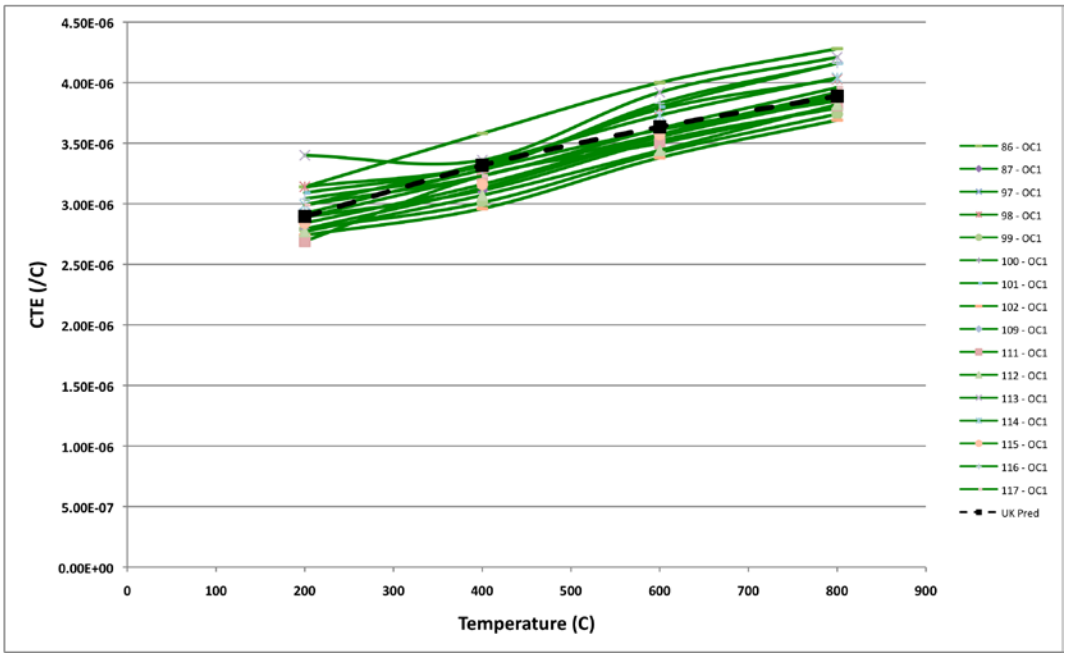


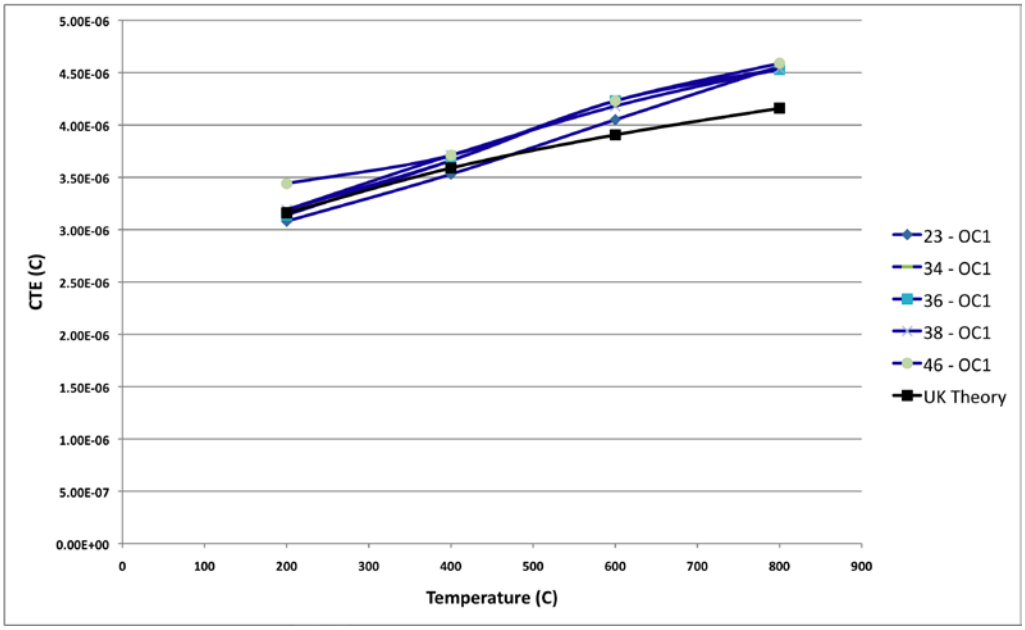
Figure 18: Pre-Irradiated Dilatometer Data from OC-1 and OC-3

Figure 19 shows the post-irradiated dilatometer data for H-451 specimens in the OC-1 experiment. The data are split into reference and stressed specimens. The reference data indicate a similar variability in the mean CTE to the pre-irradiated data and are well represented by the UK theory. There are fewer specimens available in the stressed figures and the predictions based on the UK theory appear to under predict the temperature dependence at 13.8 MPa but represent the data reasonably well at 20.7 MPa. ***This requires further consideration.***

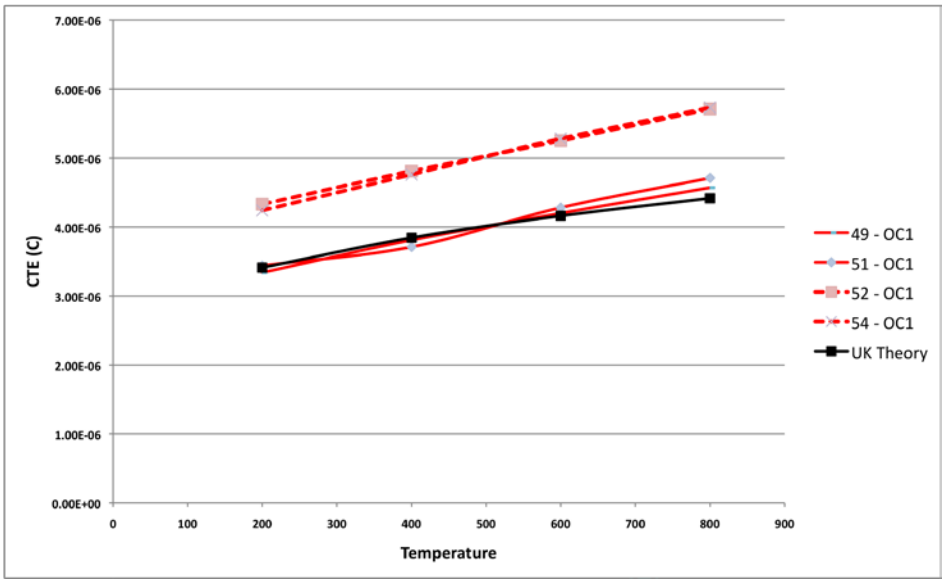
Two additional datasets are shown in Figure 19 which were found in the extension datasheets but are not referenced in the computer printouts or the Ph.D. They have been presented as 20.7 MPa data but the history of the specimens is not known. The data exhibit a similar trend to the other stressed data but have a higher CTE. It may be that additional specimens have been irradiated but not reported. ***This requires further investigation.***



a) Reference



b) 13.8 MPa



c) 20.7 MPa

Figure 19: Post-Irradiated Dilatometer Data from OC-1

Figure 20 shows the effect of the external load on the mean CTE measured at 800°C. There is considerable scatter in the unstressed CTE and some overlap of stressed data at low fluence. The 13.8 MPa data exhibit some scatter which may be out of trend with the 20.7 MPa data. ***This should be investigated further.***

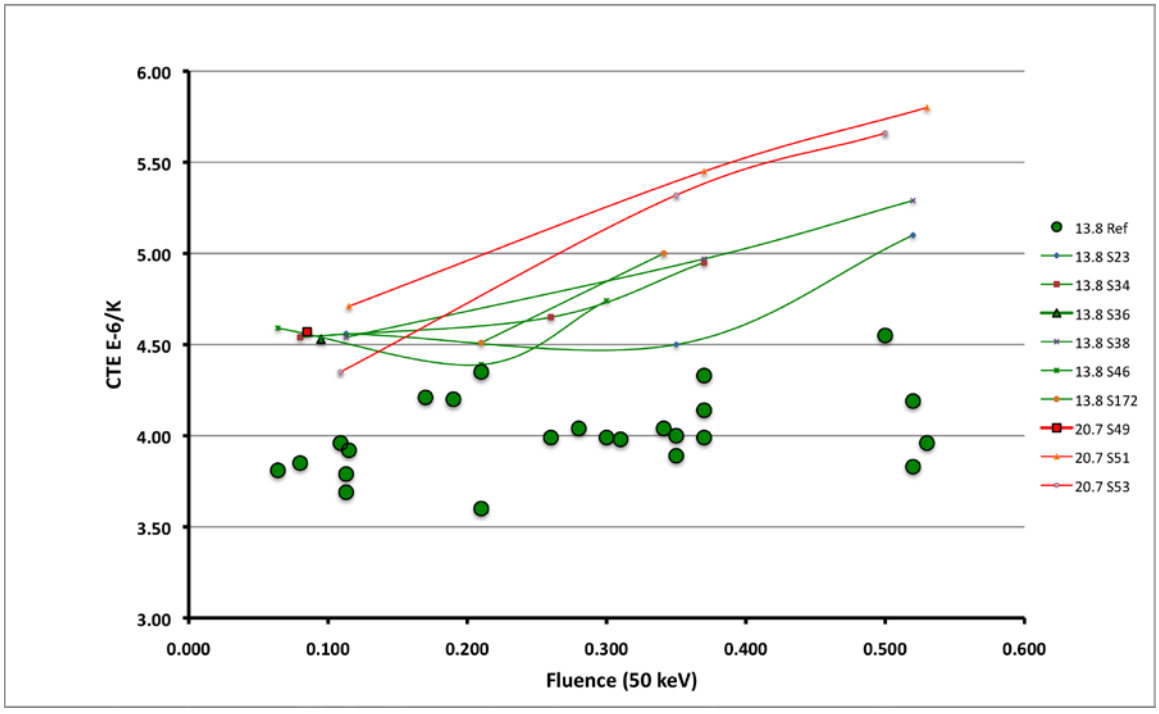


Figure 20: Effect of External Load on CTE (800)

600 ℃

Dimensional change

The dimensional change data, length and diameter have been re-calculated using engineering strain. The dimensional change data were re-calculated using large strain formulation and as expected no significant difference was observed at these modest strains.

The direct and lateral dimensional change data at 600°C are presented in Figure 21 and 22. The data exhibits little scatter and clear separation between the 13.8 MPa and 20.7 MPa specimens.

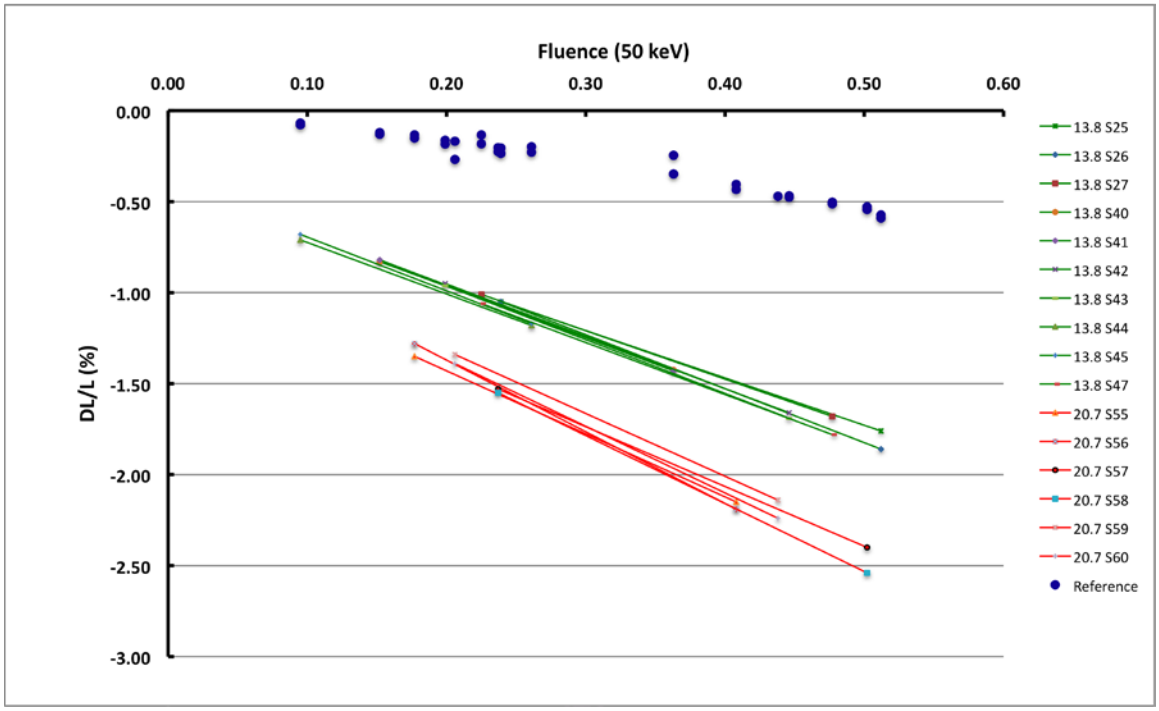


Figure 21: 600°C Direct dimensional change data

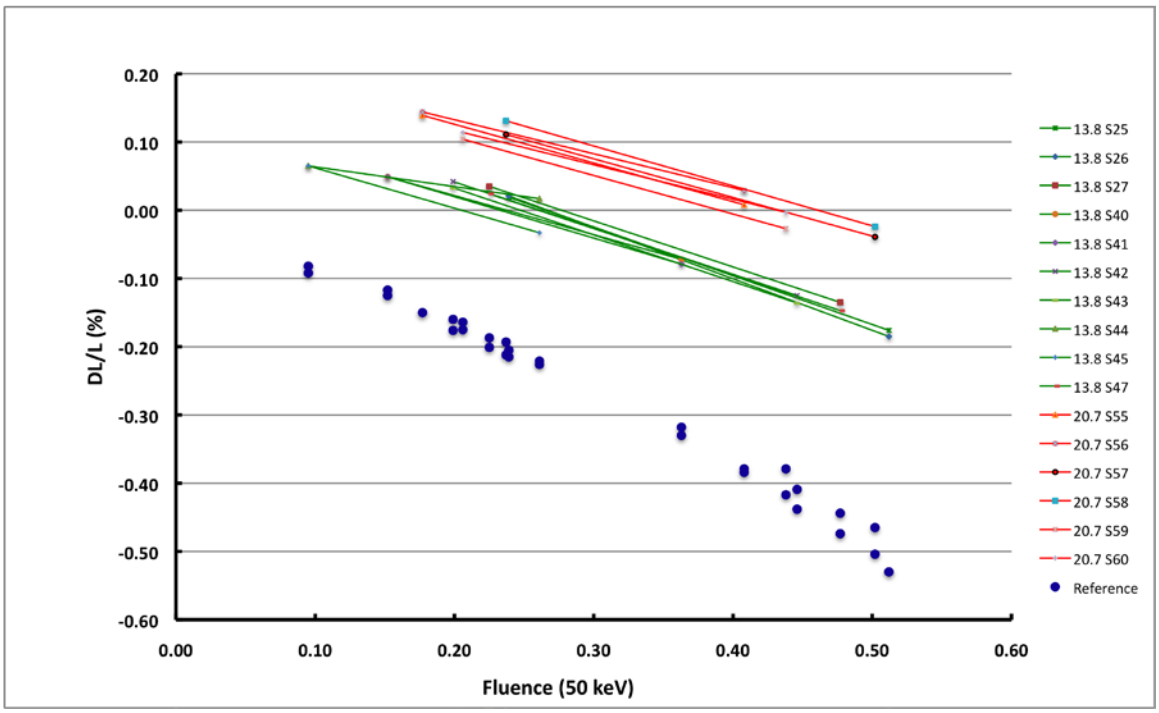


Figure 22: 600°C Lateral Dimensional Change Data

The volume data used to determine the change in density of the specimen was modified for the internal hole drilled in the reference specimens to allow thermal couple insertion and for the spacer holes drilled in the stressed specimens. The modified volume change was used in the derivation of the Modulii via the density. The modified Volume is shown in Figure 23. In contrast to the 900°C data the data are well ordered and appear to indicate significant volume change at low fluence (or low creep strain) followed by a period of relatively low volume change.

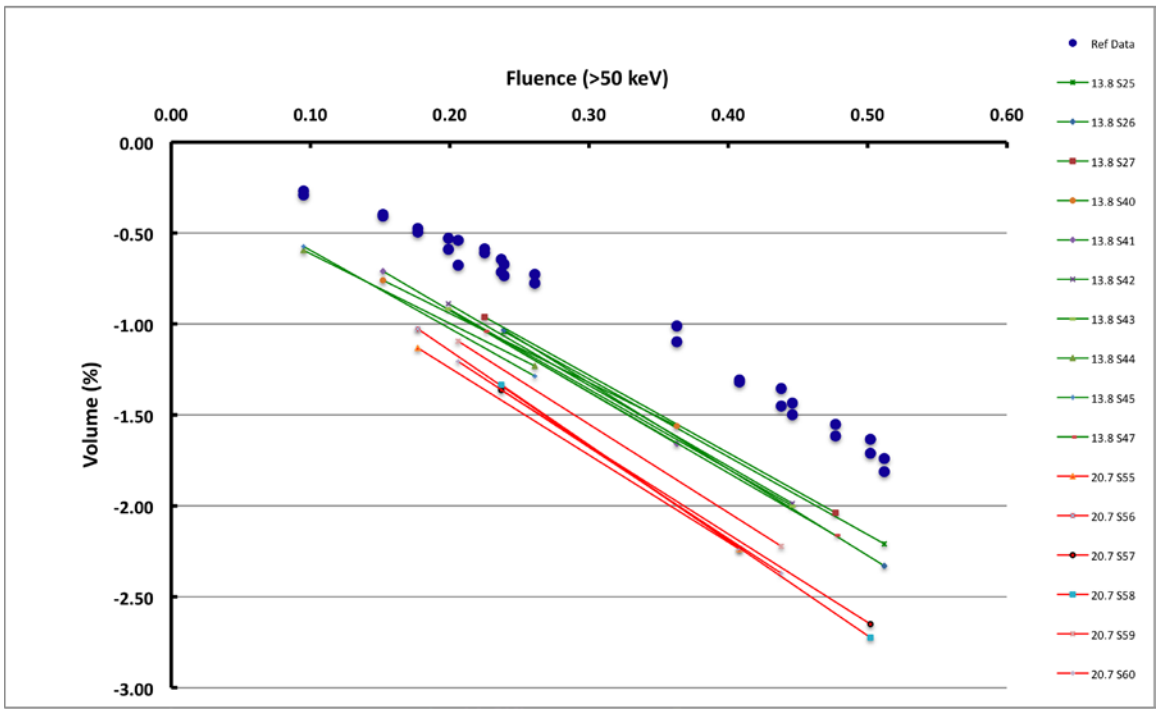


Figure 23: 600°C Volume Change Data

Irradiation Induced Creep

The quoted creep data have been derived by the difference between the stressed and reference specimens at the same position (axial height) within the column. No corrections appear to have been made to the measured data, however, it is not known which reference specimens were used in the original analysis.

The creep strain has been calculated assuming the German KFA correction for the changes in CTE and Modulus (See Appendix C). The modification resulted in a 5% correction to the data. The lateral creep data is presented uncorrected as there is insufficient data to make the corrections.

The direct and lateral data are presented in Figures 24 and 25 and as expected from the dimensional change data show a very coherent picture with clear separation in the creep strain between 13.8 MPa and 20.7 MPa.

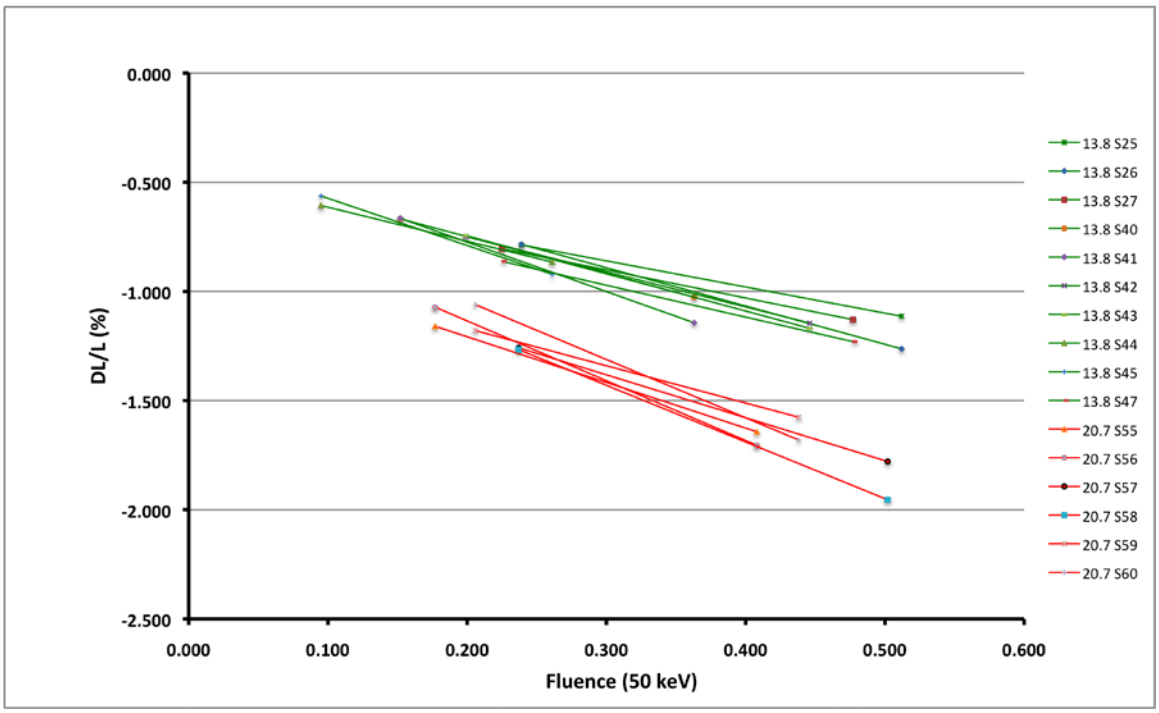


Figure 24: 600°C Direct Creep Data

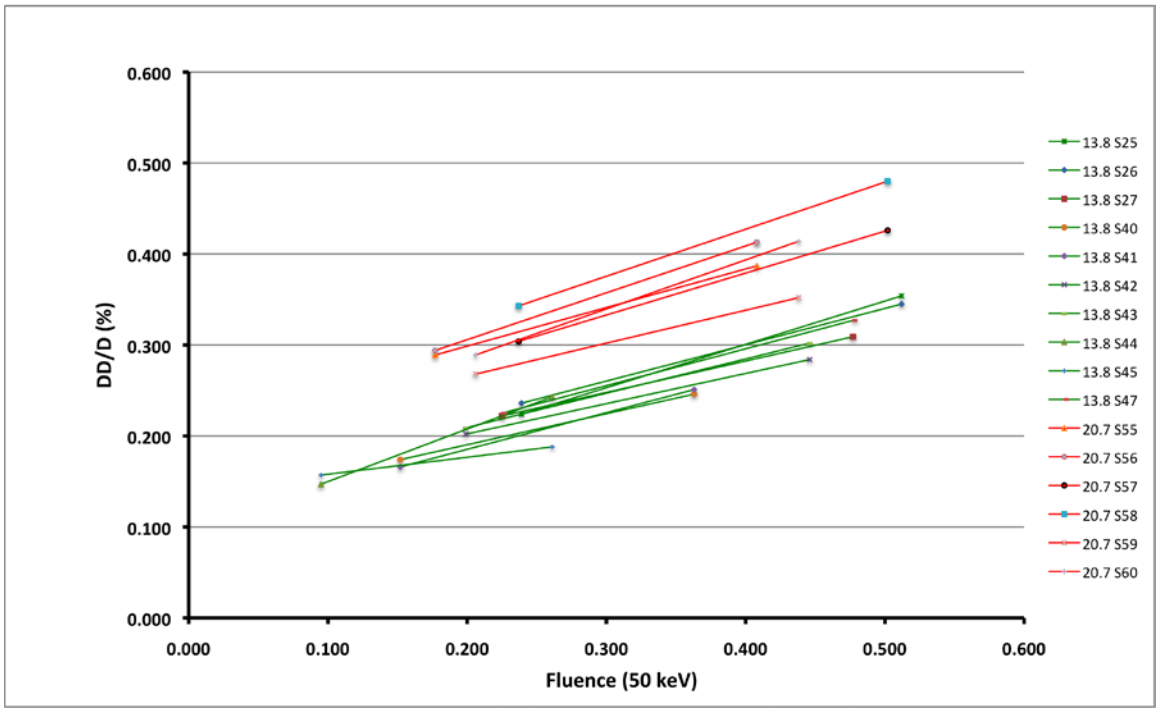


Figure 25: 600°C Lateral Creep Data

The direct creep data have been normalized by initial esu and presented in Figure 26. The normalization has used the initial dynamic Modulus. The two stress values collapse to a single dataset.

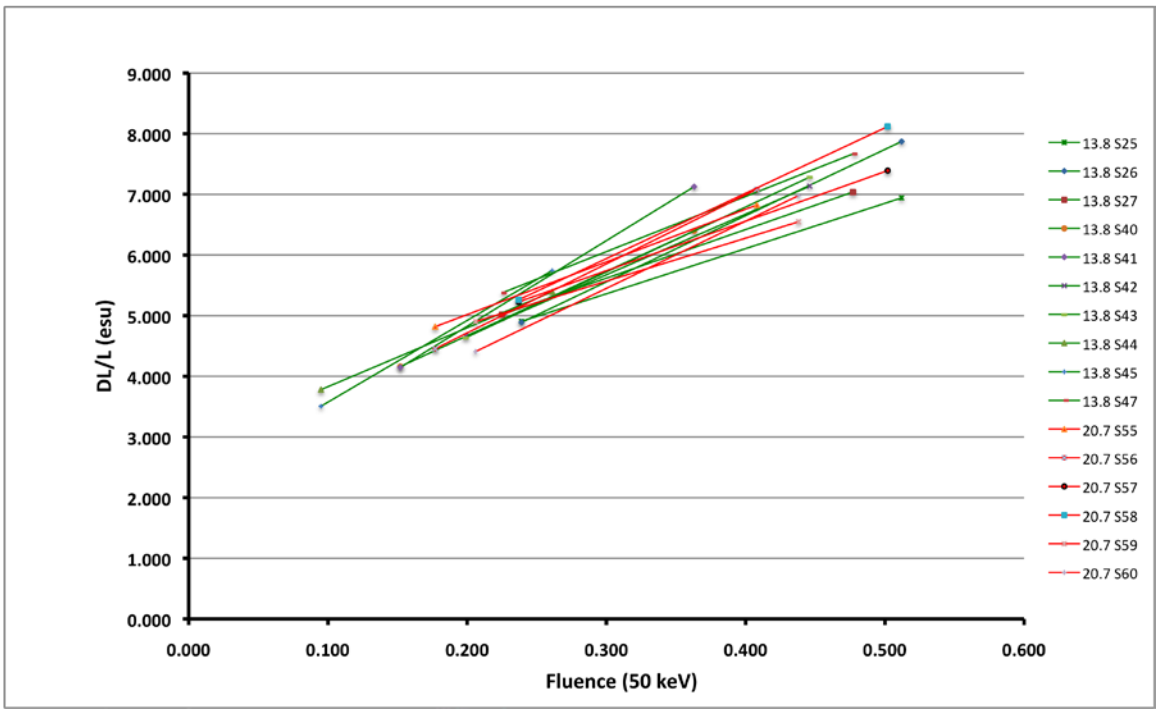


Figure 26: 600°C Normalised Direct Creep Data

Modulus

At the present time no pre-irradiated data has been discovered and so factorial changes cannot be assessed. The irradiated Young's Modulus data at 600°C are presented in Figure 27. The data are separated into Reference and Stressed specimens and indicate a modest dependence of Modulus on applied external load (at these levels of load and fluences). Figure 28 shows the equivalent plot for Shear Modulus and would appear to indicate a smaller dependence on applied external load at these levels of load and fluence.

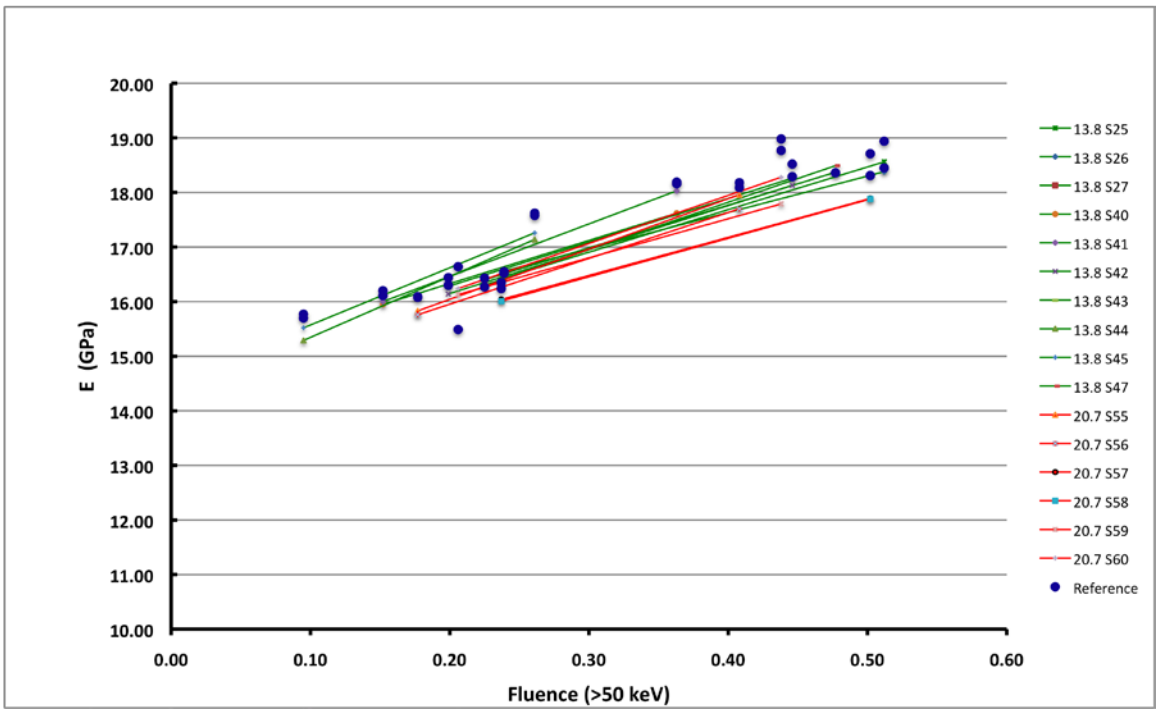


Figure 27: Young's Modulus at 600°C

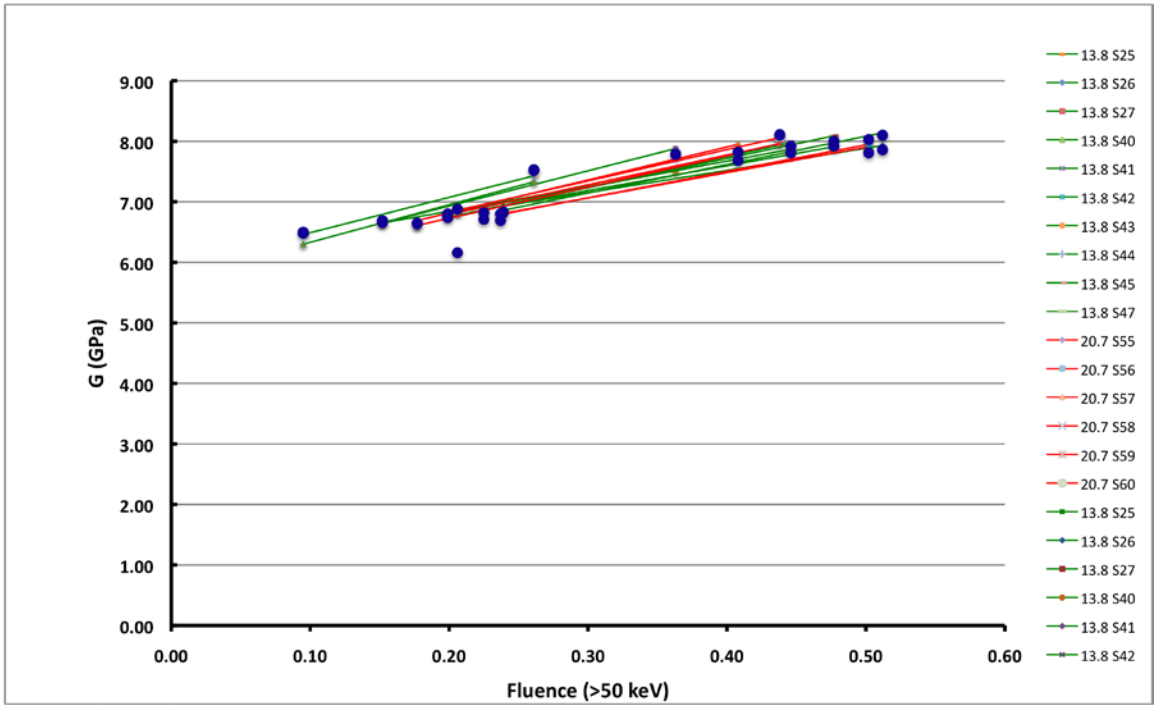


Figure 28: Shear Modulus at 600°C

Poisson's Ratio

The 600°C H-451 data presented in the US/UK exchange is shown in Figure 29 as a function of creep strain. The 900°C decrease in Poisson's ratio is also plotted in Figure 29 and indicates that the decrease in Poisson's ratio at 600°C is similar to that at 900°C,

which has previously been called into question casting some doubt on the validity of Figure 29.

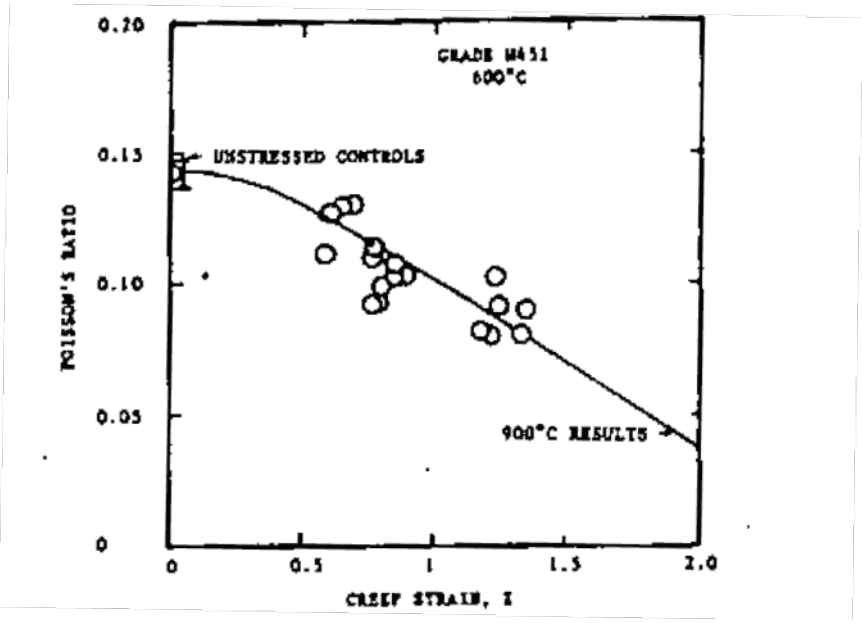


Figure 29: Effect of Creep strain on Poisson's ratio at 600°C **(Kennedy and Eatherly, 1979)**

Far more Poisson's Ratio data are reported in the 600°C computer print out and the effect of applied external load on Poisson's ratio is shown in Figure 30 for H-451 and indicates an initial rise in Poisson ratio (based on 900°C unirradiated data as no unirradiated 600°C data has been found) followed by a subsequent decrease. This initial rise in Poisson's ratio is not represented in the data presented by Kennedy in Figure 29. Also the subsequent reduction is not as severe as that presented by Kennedy. Additionally, inspection of the available 600°C data indicates no Poisson's ratio data below 0.10 suggesting that Figure 29 is incorrect and should be ignored.

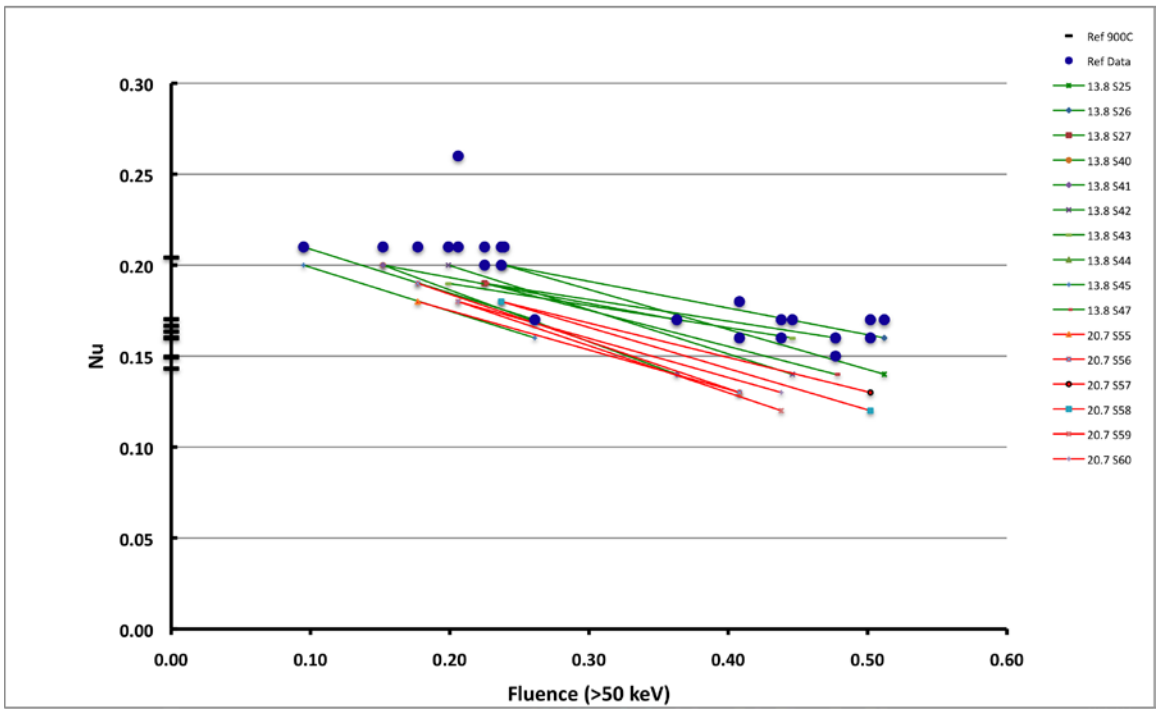


Figure 30: Effect of external load on Poisson's ratio at 600°C

Coefficient of Thermal Expansion

Figure 31 shows the representation of the CTE dilatometer data from the OC-2 and OC-4 600°C series of experiments presented at the 1979 carbon conference (Kennedy and Eatherly, 1979). As with the 900°C data, Kennedy evaluated by eye the dilatometer data as a linear function of temperature with A the intercept (i.e. the mean CTE at 0°C) and B the slope. In Figure 31, A is presented as A/A_0 which is believed to be ratio of the stressed CTE to the unstressed CTE and B is presented as the slope determined from the stressed specimen. As stated earlier this approach is considered questionable as the evaluation is subjective and the data are non-linear.

A/A_0 and B are relatively flat for all grades up to 1.5% creep strain and the interpretation of these results is significantly influenced by the quoted pre-irradiated values. The pre-irradiation characterization data for the OC-2 and OC-4 experiments have not been found. ***It is recommended that these data are found.***

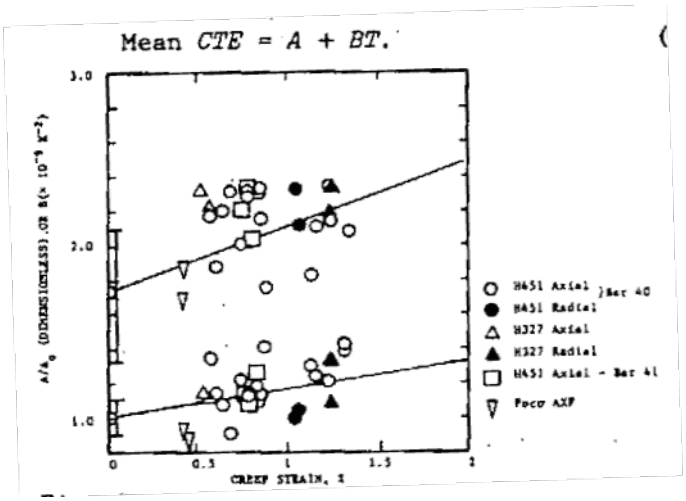
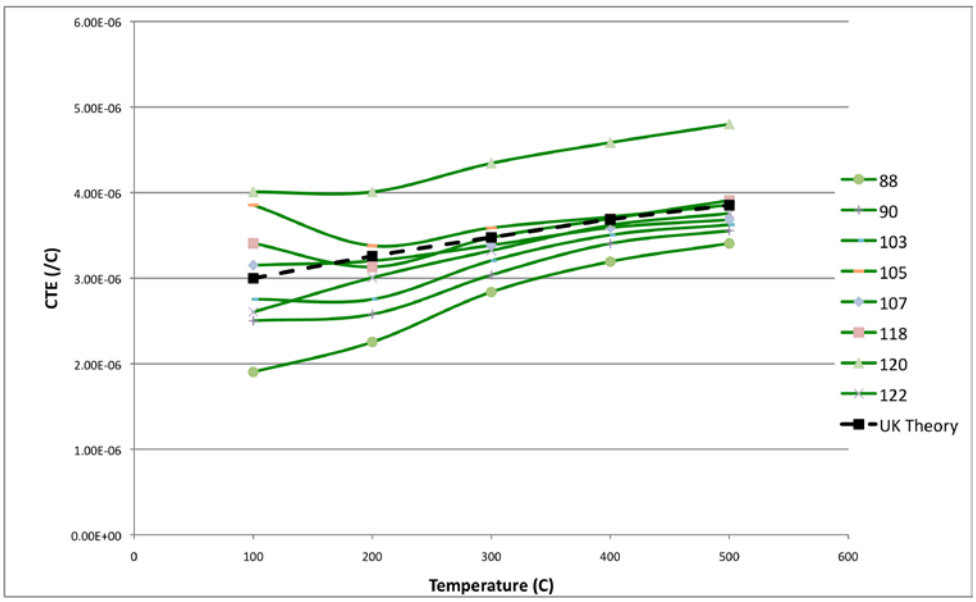


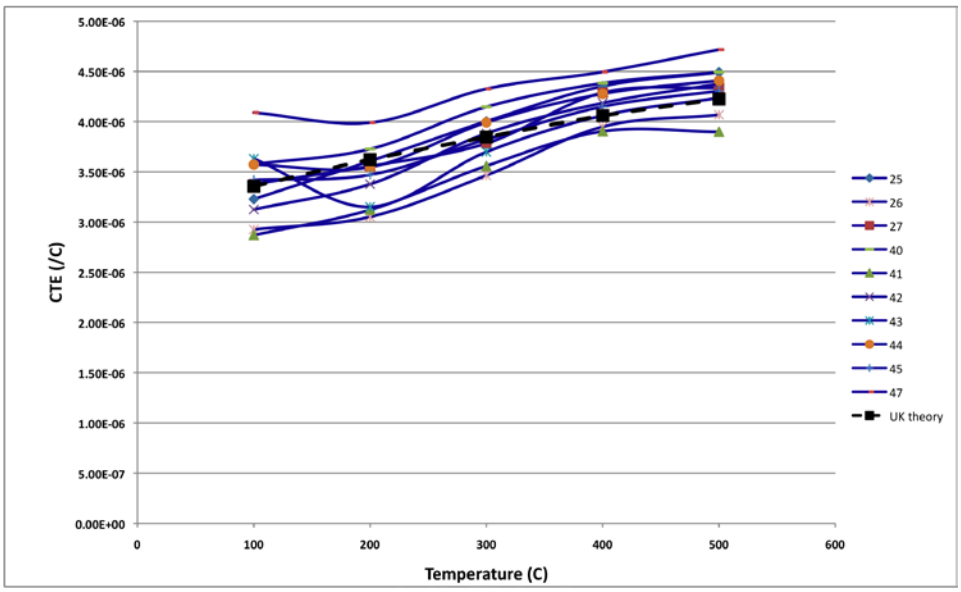
Figure 31: OC2 & OC4 - Effect of Creep Strain on the Mean Coefficient of thermal Expansion (α=A+BT) (Kennedy)

The available dilatometer data from OC-2 and OC-4 have been re-assessed from the available extension data presented in Appendix B. As for OC-1 and OC-3 the determination of the mean CTE at 500°C from the extension data were similar in trend to previously quoted values but systematically offset by 0.5E-6/°C. This represents a correction for the thermal expansion of quartz and is a consequence of the experimental apparatus and technique. For the purposes of this reassessment it has been included in the OC-2 and OC-4 analyses.

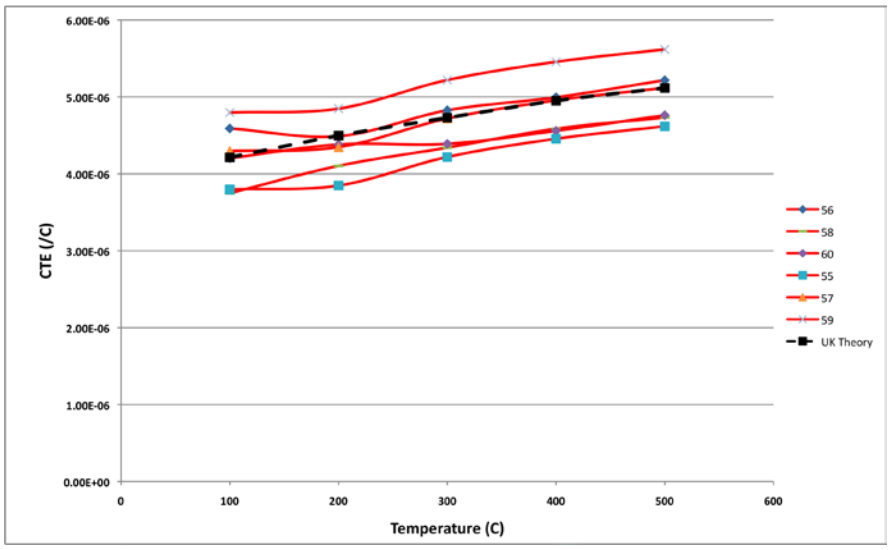
Figure 32 shows the post-irradiated dilatometer data for H-451 specimens from the OC-2 experiment. The data are split into reference and stressed specimens. The OC-2 reference and stressed data are well represented by the UK theory.



a) Reference



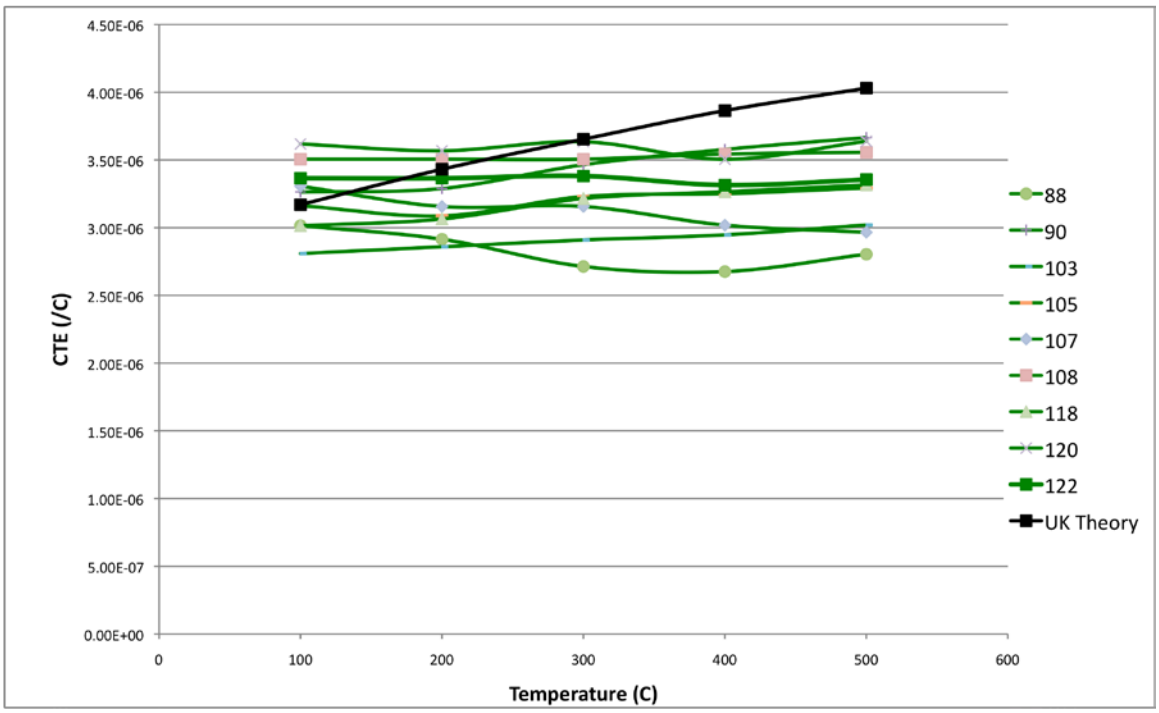
b) 13.8 MPa



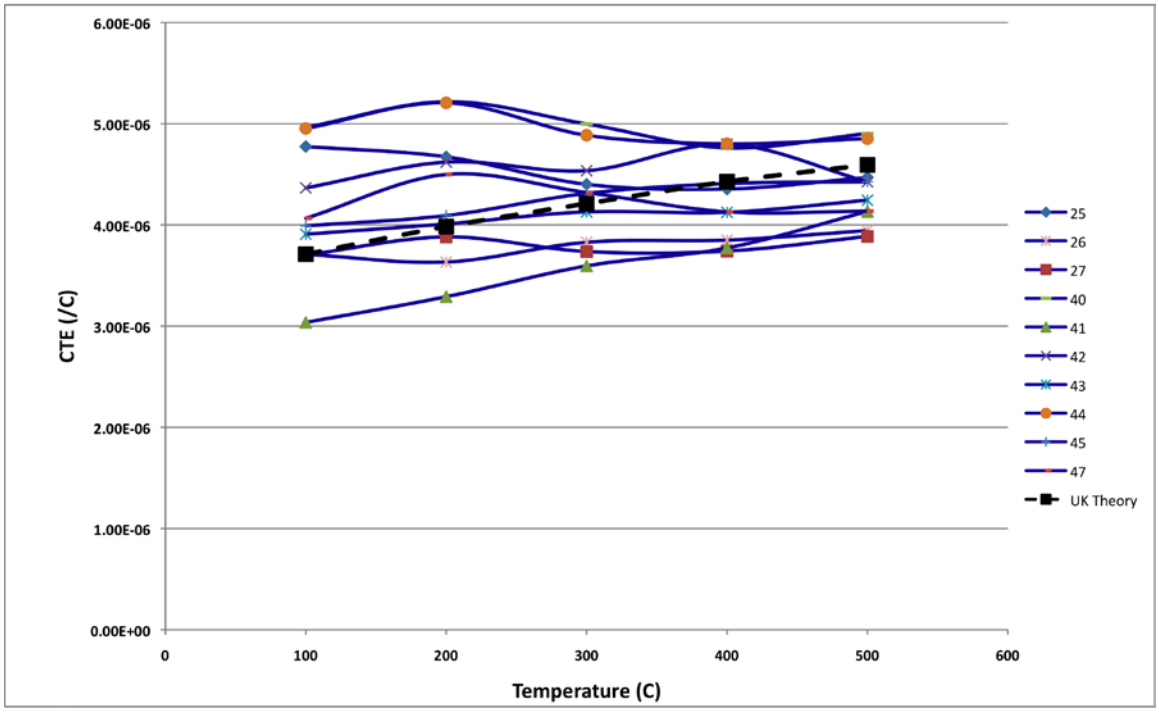
c) 20.7 MPa

Figure 32: Post-Irradiated Dilatometer Data from OC-2

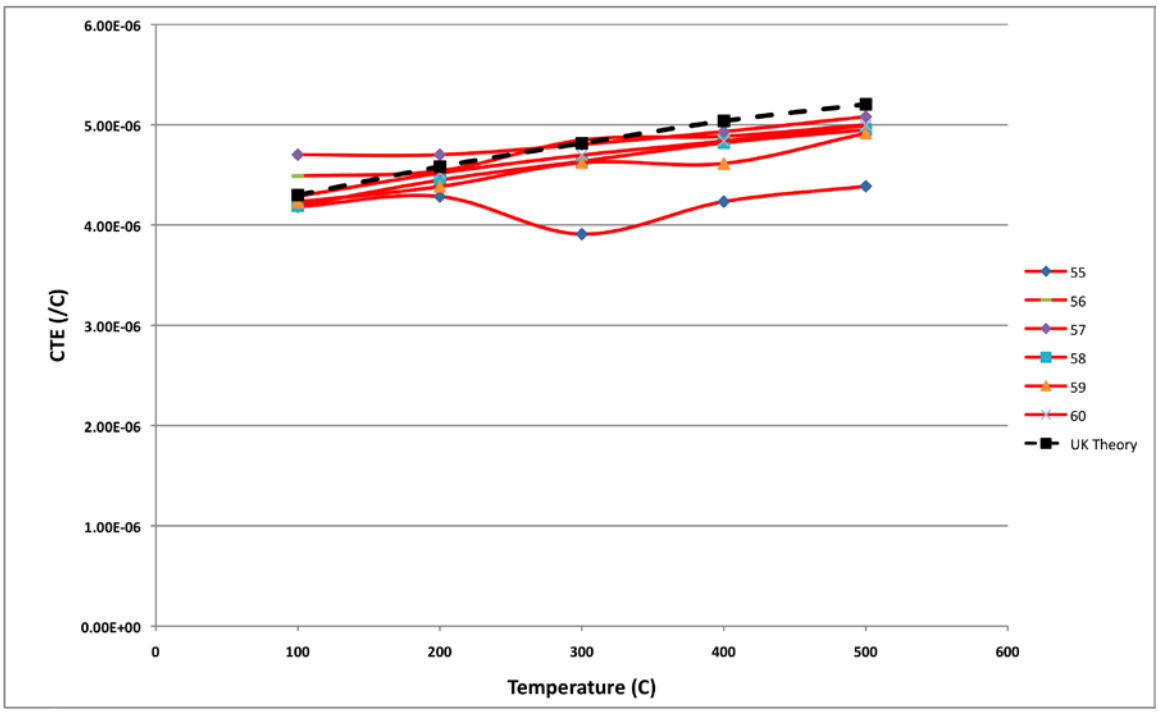
Figure 33 shows the post-irradiated dilatometer data for H-451 specimens from the OC-4 experiment. The UK theory prediction does not represent the reference or 13.8 MPa data particularly well although it does predict the 20.7 MPa very well. ***This requires further consideration.***



a) Reference



b) 13.8 MPa



c) 20.7 MPa

Figure 33: Post-Irradiated Dilatometer Data from OC-4

Figure 34 shows the effect of the external load on the mean CTE measured at 500°C. There is scatter in the unstressed and stressed CTE clear separation between the datasets at quite low fluence. The effect of the external load on CTE of irradiated H-541 at 600°C appear to have saturated which does not appear to be the case for specimens irradiated at 900°C. ***Further work is required to improve the available data if possible and calculate the fractional change in CTE.***

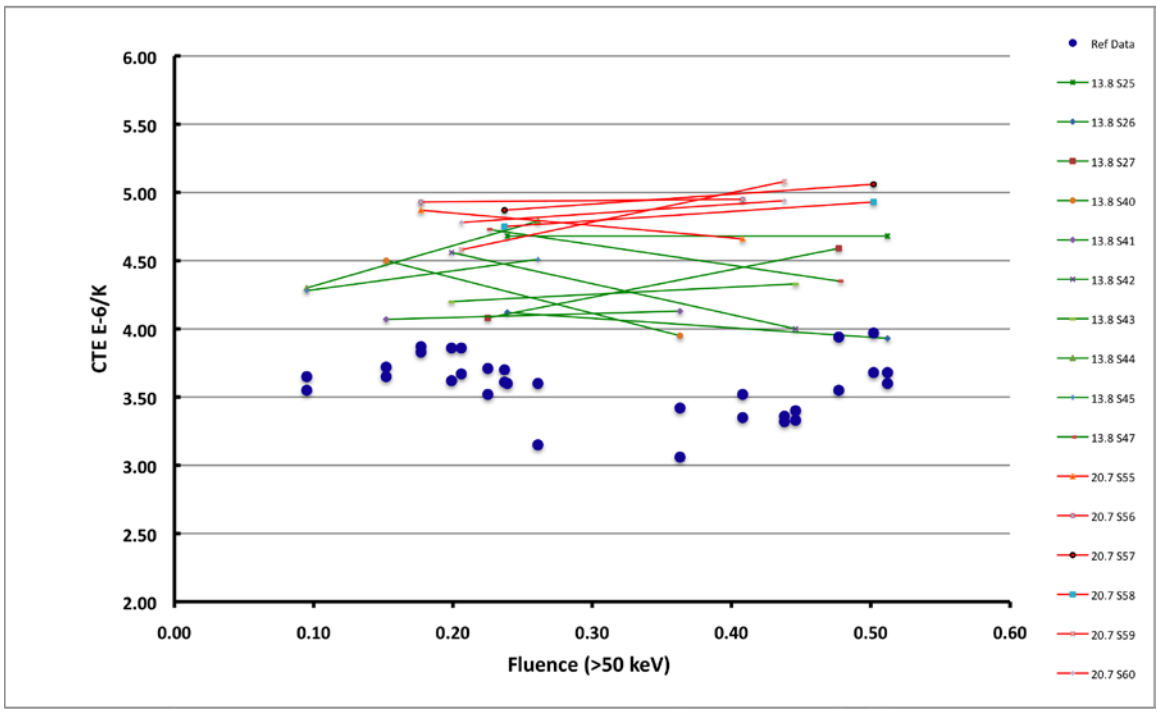


Figure 34: Effect of External Load on CTE (500)

Discussion

The original OC-Series experiments planned to irradiate 3 sets of 28 stressed specimens along with their reference specimens to incremental fluences of 1, 2, 4 and 8 (10^{25} n/m^2 E>0.18 MeV) at 600°C, 900°C and 1250°C. Due to funding constraints the OC-Series was cut short and 3 sets of 28 stressed specimens were irradiated at 900°C (OC-1,-3,-5) and 2 sets of 28 stressed specimens were irradiated at 600°C (OC-2,-4,).

26 thermocouples fixed to the specimen holders were provided to monitor the Capsule temperature and the reference specimens were hollow to facilitate the translation of a movable thermocouple down the complete stack of specimens within the capsule.

Within the Capsule there was a factor of two variation in gamma heating along the column. To manage this variation five discrete gaps were used between the specimen holder and the Capsule with 20 heaters distributed along the column for fine control. Only 17 of the 20 heaters survived the total irradiation. At present it is not known which heaters failed or when they failed but this may be deduced from the temperature history. It is recommended that the temperature history of all the experiments is revisited.

For the duration of OC-1 it was difficult to maintain the Capsule temperature at 900 ± 10 °C down the length of Capsule. It was found that that the thermal design was erroneous and that the Capsule temperature was high (930°C) in the top two positions and low (unknown) in positions 4 and 5 within the Capsule. There is also a 20°C systematic difference in irradiation temperature between the reference columns in the North and South of the Capsule.

It is not known if this is linked to the loss of heaters of if a similar variation in temperature is observed between the stressed columns. Irradiation creep is sensitive to irradiation temperature at 900°C and these variations should be investigated further.

Pre and Post irradiation radiographs were taken of the Capsule OC-1 and revealed that no obvious defects were found except that one of the reference columns had moved up by 12.7 mm and was attributed to movement of the thermocouple. It was not thought that this would have a significant effect on the results however given the discussion above this should be investigated further.

Additionally stressed specimens were solid and had different diameters to obtain different stresses within the same column. Therefore different thermal designs were required for the stressed specimens within a stressed column and for the reference column. If the thermal design were re-analysed with modern finite element analysis would this reveal differences in specimen temperatures between the stressed specimens and reference specimens especially at the higher irradiation temperature where radiation effects may be important.

The bellows of Column 4 of OC-1 was subject to binding and potentially overloaded the column during the early phases of the experiment due to the thermal expansion of the column. The exact nature of this abnormal load configuration is not known but presumably leads to overstress in some specimens. Additionally during PIE it was observed that the spacers interfered with the stressed specimens and considerable force was required to remove the spacers in one column (it was not specified which). This would set up unusual stress patterns within the specimens (i.e. restrained shrinkage) and may have affected the results.

The results from the specimens within this column lead to some interesting but uncertain observations and require further analysis beyond the scope of this report.

No experimental reports were found for OC-2 through OC-5. Additional efforts should be made to extract details of these experiments.

From a data perspective it was also observed that some difference in fluence at various positions throughout all the Capsules were recorded between the reference and stressed specimens. This requires further information to resolve.

For the 900°C series of experiments there is considerable variability in the results, which may be due to the temperature variations above and could be investigated further.

In contrast to direct creep data (Figure 6) the lateral creep data (Figure 7) indicates little or no lateral creep at low fluences. Also shown in Figure 7 is the Column 4 data indicating that lateral creep has saturated earlier or at a lower level, which would not be expected if the specimens were significantly overloaded. Both these aspects require further consideration.

Of considerable importance is the discovery of annealed specimens. The analyses clearly illustrate the total recovery of creep strain in excess of 3.5 esu, which is substantially in excess of 1 esu normally attributed to primary creep strain. It should also be noted that these annealing results indicate there is apparently no secondary or “irrecoverable” creep established at these low fluences.

Unfortunately no data on the material property measurements of annealed samples was found. It is recommended that efforts are maintained to uncover this data if it available.

These anneal experiments are at very low fluence and it is recommended that irradiation anneal experiments should be included as part of future experiments. Any future anneals should commence at higher starting fluences to determine the full extent of “recoverable” creep and whether it saturates or not.

Some of the annealed data exhibit considerable recovery beyond the reference data set. This “over recovery” has been observed in thermal annealing experiments of unstressed PGA graphite and has also been observed in UK unstressed experiments where

specimens have been re-irradiated at different irradiation temperatures and overshoot in the dimensional change has been observed.

In contrast to the 900°C data the 600°C data are subject to significantly less variability. This may be due to improved temperature and load control. This is illustrated by the volume behaviour (Figures 5 and 23). The 900°C data exhibit considerable scatter and show little separation at low fluence followed by subsequent increase in volume change at higher fluence (may be due to problems associated with OC-1 discussed above). This is in stark contrast to the 600°C irradiations where the data are well ordered and indicate significant volume change at low fluence (or low creep strain) followed by a period of relatively low volume change.

When the 900 °C Modulus are plotted as absolute values little or no dependence on stress levels is apparent. A small dependence on stress is apparent from the absolute Modulus values of the irradiations carried out at 600 °C.

When the 900 °C data are plotted showing specimen history and evaluated as fractional change in Modulii they appear to indicate a different behaviour with the Modulus obtained from stressed samples increasing at a different rate to reference specimens. This is an unexpected result and requires further investigation. No unirradiated results were uncovered for irradiations at 600 °C so fractional changes cannot be analysed at present.

The previously reported graphical H-451 Poisson's ratio data reported by Kennedy et al (1979) and reported by Brocklehurst and Kelly (1989) has been shown to be erroneous and should not be considered further.

Only OC-1 irradiated Poisson data could be found at 900°C and this showed a modest increase in Poisson ratio at low fluence with little or no difference between stressed and reference specimens. The initial rise is consistent with irradiated data obtained at 600°C, however the data at 600°C indicate a dependence of Poisson ratio on stressed level with increasing stress decreasing Poisson ratio. This raises the question does tension induce the opposite effect?

The previously presented graphical H-451 CTE temperature dependence data presented by Kennedy has been shown to be questionable. The trend lines through the data appear to be misleading due to the unstressed data not being presented and the data at high creep strain were obtained from the overstressed data. Although the data from the overstressed specimens has not been considered as part of this work it may reveal important information for future experiments and should be investigated further.

The dependence of CTE on external load was re-evaluated from dilatometer data. The evaluation required an additional systematic offset due to the thermal expansion of quartz to reproduce the previously quoted CTE (800) values. This correction is consequence of the experimental technique and apparatus.

There is considerable variability exhibited in the CTE obtained from both the pre-irradiated and post-irradiated extensometer data. The CTE (800) show considerable scatter but indicate that compression increases CTE (800) and the increase occurs at low fluence. However due to the scatter it is difficult to determine whether the change in CTE (800) has saturated at these fluences. The CTE(500) data also show considerable scatter and indicate that compression increases CTE(500) at very low fluences. The data may also indicate that the increase in CTE(500) has saturated at these low fluences.

A UK theory of CTE was applied to predict the effects of stress. The UK theory assumes that the temperature dependence of CTE is not affected by the applied external load, i.e. the effects of an external load on CTE can be measured over a relatively low temperature range and extrapolated to higher temperatures using the temperature dependence of crystal CTEs. This assumes that the effect of the external load on crystal CTEs is negligible.

As discussed above there is significant scatter in the dilatometer data but the UK theory is considered to predict the temperature dependence of CTE reasonably well for all available Capsules for both unstressed and stressed specimens with the exception of OC-4 unstressed specimens. The OC-4 unstressed specimens appear out of trend with all the other results and this should be investigated further. It is not known whether significant structural changes have taken place at these modest fluences so this analysis only provides limited support for the UK approach. It is known that there is higher fluence data on H-451 irradiated at 900°C in Petten. Some correspondence between KFA and ORNL was uncovered as part of the search of the ORNL archive. This correspondence should be investigated further.

During the course of this work two additional dilatometer measurement sets at 20.7 MPa were found. It is not known where these came from. Whilst they exhibit the same trend in temperature dependence the absolute CTE value is higher. These specimens need to be investigated further.

Conclusions and Recommendations

1. The archive associated with the OC-Series graphite irradiation creep experiments has been reviewed and a number of significant pieces of data have been uncovered.
2. Previously quoted Poisson's ratio dependence on creep has been demonstrated to be ill founded and as a result should not be considered further.
3. The CTE analysis methodology was found to be physically unsound and as a consequence published relationships between CTE and creep strain were found to be questionable.
4. Anneal data from the OC-Series indicates that there is substantial recovery of dimensional change well in excess of values normally attributed to primary creep. Some over recovery in dimensional change was observed and it is recommended that this is investigated further.
5. The 900°C Modulus data revealed some unexpected stressed specimen history behaviour when compared to reference history behaviour. It was not possible to examine the 600°C in the same way as there were only two irradiation Capsules spanning the fluences where the changes at 900°C become apparent. It is recommended that this is investigated further.
6. Whilst subject to significant scatter, the CTE data appear to have saturated at 600°C but not necessarily at 900°C. It is recommended that the CTE data are investigated further.
7. The CTE data appear to be well represented by the UK theory.
8. During the archive search substantial data were found on other experiments such as the ORR series and Petten (US/FRG exchange – H-451 & ATR-2E). It is recommended that these are examined in more detail.

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Appendix A 900°C Specimen Characterisation Archive Data

Hand written sheets of data were discovered in the archive for the OC1, OC3 and OC5 900°C experiments. Specimen pre-characterised were also included. Similar information for OC2 and OC4 600°C experiments has not been uncovered yet. The datasheets are reproduced here for future reference.

Specimen No		13			
Experiment		Pre	OC-1	OC-3	OC-5
Position			E6	E6	E6
Dose			10.2	32.9	46.8
Diameter (in)	Top 0	0.6	0.6012	0.6021	
	Top 90	0.6001	0.6016	0.6021	
	Top 120	0.6001	0.6013	0.6019	
	Top 240	0.6001	0.6014	0.6025	
	Mid 0	0.6	0.6008	0.6001	
	Mid 90	0.6001	0.6009	0.6002	
	Mid 120	0.6001	0.6009	0.6002	
	Mid 240	0.6001	0.601	0.6	
	Bot0	0.6	0.6014	0.6018	
	Bot 90	0.6	0.6015	0.6023	
	Bot 120	0.6	0.6016	0.6022	
	Bot 240	0.5999	0.6013	0.6021	
Length (in)	0	0.9997	0.9921	0.9805	
	120	1.0005	0.992	0.9806	
	240	1	0.9923	0.9806	
	0	0.9997	0.9921	0.9805	
Weight (gms)		7.8006	7.8008	7.8208	
Density (g/cm^3)		1.7127	1.7195	1.7393	
Sonic Times (μg)					
	Long	10.7		2.98	
	Shear (max)	17.6		1.86	
	Shear (min)	17.6			
Eddy Current (μΩ-m)					
	Top		-103	-151	-184
	Bottom		-102	-148	-1886
	Side (max)		-152	-208	-256
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.54	3.19	3.65	
	400°C	2.98	3.63	4.05	
	500°C			4.19	
	600°C	3.25	4.18	4.35	
	800°C	3.56	4.52	4.48	

Specimen No	**14**				
Experiment		Pre	OC-1	OC-3	OC-5
Position			W6	W6	W6
Dose			10.2	32.9	46.8
Diameter (in)	Top 0	0.6	0.6027		
	Top 90	0.6	0.6026		
	Top 120	0.6001	0.6026		
	Top 240	0.6	0.6026		
	Middle 0	0.6	0.6015		
	Middle 90	0.6	0.6015		
	Middle 120	0.6001	0.6015		
	Middle 240	0.6	0.6015		
	Bottom 0	0.6001	0.6023		
	Bottom 90	0.6001	0.6024		
	Bottom 120	0.6001	0.6027		
	Bottom 240	0.6	0.6025		
Length (in)	0	1.0002	0.9858		
	120	1.0001	0.9858		
	240	1.0003	0.986		
	0	1.0002	0.9858		
Weight (gms)		7.776	7.7766		
Density (g/cm^3)		1.7069	1.7197		
Sonic Times (μg)					
	Long	11.1			
	Shear (max)	17.6			
	Shear (min)	17.6			
Eddy Current (μΩ-m)					
	Top		-110	-155	-186
	Bottom		-118	-148	-194
	Side (max)		-163	-215	-253
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200^{o}C	2.64	3.24	3.8	
	400^{o}C	2.76	3.76	3.85	
	500^{o}C			3.97	
	600^{o}C	3.05	4.22	4.18	
	800^{o}C	3.38	4.58	4.39	

Specimen No	**18**				
Experiment		Pre	OC-1	OC-3	OC-5
Position			E7	E7	E7
Dose			10.5	33.7	47.9
Diameter (in)	Top 0	0.6	0.6014	0.6022	
	Top 90	0.5999	0.6014	0.6017	
	Top 120	0.5999	0.6015	0.602	
	Top 240	0.6	0.6014	0.6018	
	Middle 0	0.5999	0.6006	0.5999	
	Middle 90	0.5999	0.6006	0.5999	
	Middle 120	0.5999	0.6008	0.6	
	Middle 240	0.5999	0.6006	0.5997	
	Bottom 0	0.6	0.6015	0.6018	
	Bottom 90	0.5999	0.6011	0.602	
	Bottom 120	0.5999	0.6013	0.6017	
	Bottom 240	0.6	0.6011	0.6021	
Length (in)	0	1.0004	0.9936	0.9827	
	120	1.0001	0.9932	0.9827	
	240	1.0002	0.9933	0.9826	
	0	1.0004	0.9935	0.9827	
Weight (gms)		7.8901	7.8904	7.8911	
Density (g/cm^3)		1.7324	1.7378	1.7565	
Sonic Times (μg)					
	Long	10.6		3.05	
	Shear (max)	17.3		1.88	
	Shear (min)	17			
Eddy Current (μΩ-m)					
	Top		-98	-159	-174
	Bottom		-98	-156	-178
	Side (max)		-143	-193	-236
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200^{o}C	2.44	3.19	3.2	
	400^{o}C	2.93	3.73	3.35	
	500^{o}C			3.55	
	600^{o}C	3.27	4.37	3.7	
	800^{o}C	3.54	4.59	3.88	

Specimen No	**19**				
Experiment		Pre	OC-1	OC-3	OC-5
Position			W7	W7	W7
Dose			10.5	33.7	47.9
Diameter (in)	Top 0	0.6	0.6024		
	Top 90	0.6	0.6023		
	Top 120	0.6	0.6022		
	Top 240	0.6	0.6025		
	Middle 0	0.5999	0.6011		
	Middle 90	0.5999	0.6011		
	Middle 120	0.5999	0.6012		
	Middle 240	0.6	0.6012		
	Bottom 0	0.5999	0.6017		
	Bottom 90	0.6	0.6021		
	Bottom 120	0.6	0.6021		
	Bottom 240	0.6	0.602		
Length (in)	0	1.0002	0.9881		
	120	1.0002	0.9883		
	240	1.0004	0.9882		
	0	1.0002	0.9881		
Weight (gms)		7.88	7.8802		
Density (g/cm^3)		1.7301	1.7406		
Sonic Times (μg)					
	Long	10.5			
	Shear (max)	17.4			
	Shear (min)	17.1			
Eddy Current (μΩ-m)					
	Top		-101	-149	-176
	Bottom		-104	-151	-180
	Side (max)		-148	-196	-245
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200^{o}C	2.54	3.24	3	
	400^{o}C	2.86	3.71	3.23	
	500^{o}C			3.35	
	600^{o}C	3.27	4.15	3.52	
	800^{o}C	3.48	4.48	3.85	

Specimen No		23			
Experiment		Pre	OC-1	OC-3	OC-5
Position			E8	E8	E8
Dose			10.5	23.3	33.8
Diameter (in)	Top 0	0.6	0.6014	0.6026	
	Top 90	0.6001	0.6014	0.6023	
	Top 120	0.6001	0.6014	0.6023	
	Top 240	0.6	0.6015	0.6021	
	Mid 0	0.6	0.6008	0.6	
	Mid 90	0.6	0.6008	0.5999	
	Mid 120	0.6	0.6008	0.5999	
	Mid 240	0.6	0.6008	0.5999	
	Bot0	0.6	0.6015	0.6024	
	Bot 90	0.6	0.6014	0.6022	
	Bot 120	0.6	0.6014	0.6021	
	Bot 240	0.6	0.6014	0.6023	
Length (in)	0	1.0001	0.992	0.9802	
	120	1.0002	0.9926	0.9803	
	240	1.0007	0.9924	0.9803	
	0	1.0001	0.992	0.9802	
Weight (gms)		7.8158	7.8161	7.8185	
Density (g/cm^3)		1.7156	1.7228	1.7431	
Sonic Times (μg)					
	Long	10.7		2.98	
	Shear (max)	17.7		1.82	
	Shear (min)	17.4			
Eddy Current (μΩ-m)					
	Top		-114	-145	-189
	Bottom		-112	-143	-189
	Side (max)		-168	-198	-255
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.9	3.08	3.05	
	400°C	3.36	3.53	3.13	
	500°C			3.37	
	600°C	3.69	4.05	3.5	
	800°C	3.97	4.56	3.74	

Specimen No		24			
Experiment		Pre	OC-1	OC-3	OC-5
Position			W8	W8	W8
Dose			10.5	33.8	48.1
Diameter (in)	Top 0	0.5996	0.6017		
	Top 90	0.5998	0.6023		
	Top 120	0.5998	0.6023		
	Top 240	0.5997	0.6025		
	Mid 0	0.5991	0.6011		
	Mid 90	0.5997	0.601		
	Mid 120	0.5997	0.6011		
	Mid 240	0.5994	0.6011		
	Bot0	0.5996	0.6022		
	Bot 90	0.5999	0.6024		
	Bot 120	0.5999	0.6024		
	Bot 240	0.5997	0.6023		
Length (in)	0	1.0001	0.9864		
	120	1	0.9862		
	240	1.0004	0.9859		
	0	1.0001	0.9863		
Weight (gms)		7.7835	7.7832		
Density (g/cm^3)		1.7108	1.7225		
Sonic Times (μg)					
	Long	11.2			
	Shear (max)	17.7			
	Shear (min)	17.5			
Eddy Current (μΩ-m)					
	Top		-117	-158	-188
	Bottom		-116	-155	-188
	Side (max)		-169	-215	-266
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.8	3.44	3.85	
	400°C	3.26	3.93	4	
	500°C			4.15	
	600°C	3.59	4.27	4.27	
	800°C	3.9	4.88	4.5	

Specimen No		28			
Experiment		Pre	OC-1	OC-3	OC-5
Position			E9	E9	E9
Dose			10.5	33.8	48.1
Diameter (in)	Top 0	0.5998	0.6013		
	Top 90	0.5997	0.6011		
	Top 120	0.5998	0.6012		
	Top 240	0.5998	0.601		
	Mid 0	0.5997	0.6006		
	Mid 90	0.5997	0.6005		
	Mid 120	0.5997	0.6005		
	Mid 240	0.5997	0.6004		
	Bot0	0.5999	0.6011		
	Bot 90	0.5998	0.6009		
	Bot 120	0.5999	0.601		
	Bot 240	0.5999	0.601		
Length (in)	0	1.0004	0.9919		
	120	1.0002	0.9915		
	240	1.0001	0.9918		
	0	1.0004	0.9919		
Weight (gms)		7.7595	7.7599		
Density (g/cm^3)		1.7046	1.7132		
Sonic Times (μg)					
	Long	11.9			
	Shear (max)	18.4			
	Shear (min)	17.9			
Eddy Current (μΩ-m)					
	Top		-100		-175
	Bottom		-101		-179
	Side (max)		-174		-263
	Side (min)				-267
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	3.19	3.99	4.05	
	400°C	3.51	4.51	4.45	
	500°C			4.45	
	600°C	3.92	5	4.55	
	800°C	4.18	5.19	4.8	

Specimen No		29			
Experiment		Pre	OC-1	OC-3	OC-5
Position			W9	W9	W9
Dose			10.5	33.8	48.1
Diameter (in)	Top 0	0.5999	0.6023		
	Top 90	0.6	0.6024		
	Top 120	0.6	0.6022		
	Top 240	0.6	0.6025		
	Mid 0	0.5998	0.6014		
	Mid 90	0.5999	0.6012		
	Mid 120	0.5999	0.6012		
	Mid 240	0.5997	0.6013		
	Bot0	0.5998	0.6025		
	Bot 90	0.5999	0.6023		
	Bot 120	0.5999	0.6026		
	Bot 240	0.5998	0.6022		
Length (in)	0	0.9998	0.9834		
	120	0.9998	0.984		
	240	1.0003	0.9836		
	0	0.9998	0.9834		
Weight (gms)		7.7784	7.779		
Density (g/cm^3)		1.7088	1.7253		
Sonic Times (μg)					
	Long	11.5			
	Shear (max)	18.2			
	Shear (min)	17.8			
Eddy Current (μΩ-m)					
	Top		-103	-150	-175
	Bottom		-105	-147	-178
	Side (max)		-185	-231	-264
	Side (min)				-264
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	3.04	4.13	4	
	400°C	3.38	4.57	4.15	
	500°C			4.23	
	600°C	3.72	5.02	4.32	
	800°C	3.99	5.51	4.63	

Specimen No		34			
Experiment		Pre	OC-1	OC-3	OC-5
Position			E3	E3	E3
Dose			8.95	28.8	41
Diameter (in)	Top 0	0.6	0.6013	0.6021	
	Top 90	0.6	0.6014	0.6021	
	Top 120	0.6	0.6013	0.6022	
	Top 240	0.6	0.6013	0.6022	
	Mid 0	0.5999	0.6007	0.6003	
	Mid 90	0.5999	0.6008	0.6002	
	Mid 120	0.5999	0.6008	0.6002	
	Mid 240	0.5999	0.6008	0.6001	
	Bot0	0.5999	0.6012	0.6021	
	Bot 90	0.5999	0.6014	0.6018	
	Bot 120	0.6	0.6013	0.6019	
	Bot 240	0.6	0.6013	0.6019	
Length (in)	0	1	0.9929	0.983	
	120	1	0.9928	0.983	
	240	1	0.9931	0.983	
	0	1	0.9929	0.983	
Weight (gms)		7.7826	7.7752	7.7775	
Density (g/cm^3)		1.7077	1.7131	1.7295	
Sonic Times (μg)					
	Long	11.2		2.94	
	Shear (max)	17.7		1.79	
	Shear (min)	17.5			
Eddy Current (μΩ-m)					
	Top		-96	-153	-190
	Bottom		-104	-147	-185
	Side (max)		-152	-207	-252
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.85	3.19	3.8	
	400°C	3.26	3.66	4.13	
	500°C			4.29	
	600°C	3.46	4.23	4.42	
	800°C	3.77	4.54	4.85	

Specimen No		35			
Experiment		Pre	OC-1	OC-3	OC-5
Position			W3	N10	
Dose			9	21.9	
Diameter (in)	Top 0	0.5999	0.6024		
	Top 90	0.6	0.6024		
	Top 120	0.5999	0.6023		
	Top 240	0.5999	0.6024		
	Mid 0	0.5998	0.6011		
	Mid 90	0.5999	0.6013		
	Mid 120	0.5998	0.6013		
	Mid 240	0.5999	0.6012		
	Bot0	0.5999	0.6025		
	Bot 90	0.5999	0.6023		
	Bot 120	0.5999	0.6023		
	Bot 240	0.6	0.6023		
Length (in)	0	0.9996	0.986		
	120	0.9999	0.9859		
	240	0.9996	0.9858		
	0	0.9996	0.986		
Weight (gms)		7.774	7.7751		
Density (g/cm^3)		1.7082	1.7205		
Sonic Times (μg)					
	Long	11.2			
	Shear (max)	17.7			
	Shear (min)	17.5			
Eddy Current (μΩ-m)					
	Top		-96		
	Bottom		-107		
	Side (max)		-149		
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.95	3.39		
	400°C	3.38	3.83		
	500°C				
	600°C	3.54	4.28		
	800°C	3.84	4.66		

Specimen No		36			
Experiment		Pre	OC-1	OC-3	OC-5
Position		0	E5	N5	
Dose		0	10	32	
Diameter (in)	Top 0	0.5999	0.6014	0.5991	
	Top 90	0.5999	0.6014	0.5991	
	Top 120	0.5999	0.6013	0.5991	
	Top 240	0.5999	0.6015	0.5991	
	Mid 0	0.5998	0.6007	0.5998	
	Mid 90	0.5998	0.6007	0.5998	
	Mid 120	0.5998	0.6007	0.5998	
	Mid 240	0.5998	0.6007	0.5998	
	Bot0	0.5999	0.6012	0.599	
	Bot 90	0.5999	0.6013	0.599	
	Bot 120	0.5999	0.6013	0.599	
	Bot 240	0.5999	0.6012	0.599	
Length (in)	0	0.9999	0.9923	0.9909	
	120	1	0.9927	0.9908	
	240	0.9996	0.9923	0.9903	
	0	0.999	0.9923	0.9909	
Weight (gms)		7.764	7.7646	7.2815	1.7241
Density (g/cm^3)		1.7059	1.7118	1.7226	(calc)
Sonic Times (μg)					
	Long	11.3			
	Shear (max)	17.7			
	Shear (min)	17.6			
Eddy Current (μΩ-m)					
	Top				
	Bottom				
	Side (max)				
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.85	3.14		
	400°C	3.28	3.66		
	500°C				
	600°C	3.46	4.23		
	800°C	3.8	4.54		

Specimen No		37			
Experiment		Pre	OC-1	OC-3	OC-5
Position			W5	N9	
Dose			10	33.3	
Diameter (in)	Top 0	0.5998	0.6027		
	Top 90	0.5999	0.6027		
	Top 120	0.5999	0.6024		
	Top 240	0.6	0.6027		
	Mid 0	0.5998	0.6013		
	Mid 90	0.5999	0.6013		
	Mid 120	0.5999	0.6013		
	Mid 240	0.5999	0.6013		
	Bot0	0.6	0.6022		
	Bot 90	0.5999	0.6022		
	Bot 120	0.5999	0.6025		
	Bot 240	0.5999	0.6022		
Length (in)	0	0.9999	0.9858		
	120	0.9998	0.9853		
	240	1.0001	0.9856		
	0	0.9999	0.9858		
Weight (gms)		7.7786	7.7795		
Density (g/cm^3)		1.7087	1.7215		
Sonic Times (μg)					
	Long	11.3			
	Shear (max)	17.7			
	Shear (min)	17.5			
Eddy Current (μΩ-m)					
	Top		-113		
	Bottom		-115		
	Side (max)		-163		
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.7	3.19		
	400°C	3.28	3.76		
	500°C				
	600°C	3.49	4.1		
	800°C	3.7	4.59		

Specimen No		38			
Experiment		Pre	OC-1	OC-3	OC-5
Position			E11	E11	E11
Dose			10	32.3	46
Diameter (in)	Top 0	0.6	0.6014		
	Top 90	0.6	0.6012		
	Top 120	0.6	0.6014		
	Top 240	0.6	0.6012		
	Mid 0	0.6	0.6008		
	Mid 90	0.5999	0.6007		
	Mid 120	0.6	0.6007		
	Mid 240	0.6	0.6007		
	Bot0	0.6	0.6013		
	Bot 90	0.6	0.6012		
	Bot 120	0.6	0.6013		
	Bot 240	0.6	0.6013		
Length (in)	0	0.9999	0.9918		
	120	0.9999	0.9921		
	240	0.9995	0.9921		
	0	0.9999	0.9918		
Weight (gms)		7.772	7.7727		
Density (g/cm^3)		1.707	1.7144		
Sonic Times (μg)					
	Long	11.2			
	Shear (max)	17.6			
	Shear (min)	17.5			
Eddy Current (μΩ-m)					
	Top		-118	-145	-192
	Bottom		-102	-146	-190
	Side (max)		-155	-215	-250
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.8	3.19		
	400°C	3.18	3.71		
	500°C				
	600°C	3.41	4.18		
	800°C	3.82	4.54		

Specimen No		39			
Experiment		Pre	OC-1	OC-3	OC-5
Position			W11	W11	W11
Dose			10	32.3	46
Diameter (in)	Top 0	0.6002	0.6024		
	Top 90	0.6001	0.6022		
	Top 120	0.6001	0.6024		
	Top 240	0.6001	0.6022		
	Mid 0	0.6	0.6014		
	Mid 90	0.6	0.6014		
	Mid 120	0.6	0.6014		
	Mid 240	0.6	0.6014		
	Bot0	0.6002	0.6024		
	Bot 90	0.6002	0.6024		
	Bot 120	0.6002	0.6024		
	Bot 240	0.6002	0.6025		
Length (in)	0	0.9999	0.9869		
	120	1.0001	0.9878		
	240	1.0001	0.9869		
	0	1.0001	0.9868		
Weight (gms)		1.0001	7.79		
Density (g/cm^3)		7.797	1.7213		
Sonic Times (μg)		1.7114			
	Long	11.2			
	Shear (max)	17.6			
	Shear (min)	17.4			
Eddy Current (μΩ-m)					
	Top		-110	-152	-184
	Bottom		-110	-154	-187
	Side (max)		-169	-215	-266
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.85	3.34	3.55	
	400°C	3.31	3.78	3.68	
	500°C			3.77	
	600°C	3.56	4.2	3.9	
	800°C	3.96	4.62	4.19	

Specimen No		46			
Experiment		Pre	OC-1	OC-3	OC-5
Position			E1	E1	E1
Dose			7.52	21.3	34.4
Diameter (in)	Top 0	0.6002	0.6012	0.6017	
	Top 90	0.6002	0.6013	0.602	
	Top 120	0.6003	0.6014	0.6019	
	Top 240	0.6002	0.6013	0.6019	
	Mid 0	0.6002	0.6008	0.6005	
	Mid 90	0.6003	0.6009	0.6006	
	Mid 120	0.6004	0.6009	0.6005	
	Mid 240	0.6004	0.6009	0.6005	
	Bot0	0.6001	0.6013	0.602	
	Bot 90	0.6002	0.6013	0.6021	
	Bot 120	0.6004	0.6012	0.602	
	Bot 240	0.6004	0.6014	0.6022	
Length (in)	0	0.9995	0.9938	0.9852	
	120	1.0002	0.9928	0.9855	
	240	1	0.9935	0.9853	
	0	0.9995	0.9935	0.9852	
Weight (gms)		7.7826	7.7826	7.7859	
Density (g/cm^3)		1.7077	1.7137	1.7268	
Sonic Times (μg)		11.3		2.93	
	Long	17.7		1.81	
	Shear (max)	17.5			
	Shear (min)		-68	-156	-180
Eddy Current (μΩ-m)			-72	-157	-179
	Top		-122	-210	-229
	Bottom				
	Side (max)				
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.95	3.44	2.95	
	400°C	3.38	3.71	3.55	
	500°C			3.81	
	600°C	3.54	4.23	4.03	
	800°C	3.9	4.59	4.39	

Specimen No	48				
Experiment		Pre	OC-1	OC-3	OC-5
Position			W1	W1	W1
Dose			7.5	24.2	34.4
Diameter (in)	Top 0	0.6	0.602		
	Top 90	0.6001	0.6025		
	Top 120	0.6002	0.6023		
	Top 240	0.6002	0.6025		
	Mid 0	0.6002	0.6013		
	Mid 90	0.6002	0.6012		
	Mid 120	0.6002	0.6012		
	Mid 240	0.6002	0.6012		
	Bot0	0.6001	0.6025		
	Bot 90	0.6001	0.6023		
	Bot 120	0.6002	0.6026		
	Bot 240	0.6002	0.6023		
Length (in)	0				
	120	0.9998	0.9855		
	240	0.9995	0.9869		
	0	0.9996	0.9856		
Weight (gms)		0.9998	0.9855		
Density (g/cm^3)		7.7656	7.758		
Sonic Times (μg)		1.7048	1.7167		
	Long	11.4			
	Shear (max)	17.8			
	Shear (min)	17.5			
Eddy Current (μΩ-m)					
	Top		-81	-144	-179
	Bottom		-79	-146	-178
	Side (max)		-128	-202	-249
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.9	3.49		
	400°C	3.48	3.83		
	500°C				
	600°C	3.71	4.25		
	800°C	4.15	4.56		

Specimen No		49			
Experiment		Pre	OC-1	OC-3	OC-5
Position			E4	N4	
Dose			9.5	30.6	
Diameter (in)	Top 0	0.4905	0.4917	0.4905	
	Top 90	0.4906	0.4919	0.4905	
	Top 120	0.4906	0.4919	0.4905	
	Top 240	0.4906	0.4918	0.4905	
	Mid 0	0.4905	0.491	0.4895	
	Mid 90	0.4905	0.491	0.4895	
	Mid 120	0.4905	0.4912	0.4895	
	Mid 240	0.4905	0.4911	0.4895	
	Bot0	0.4906	0.4919	0.4901	
	Bot 90	0.4906	0.492	0.4901	
	Bot 120	0.4906	0.492	0.4901	
	Bot 240	0.4906	0.492	0.4901	
Length (in)	0	0.999	0.9891	0.9887	
	120	0.9992	0.9891	0.9885	
	240	0.9991	0.9891	0.9888	
	0	0.999	0.9892	0.9888	
Weight (gms)		5.2014	5.2022	0.6995	
Density (g/cm^3)		1.7251	1.7354	1.7386	1.7470 calc
Sonic Times (μg)					
	Long	11.1			
	Shear (max)	17.3			
	Shear (min)	17.2			
Eddy Current (μΩ-m)					
	Top		-120		
	Bottom		-115		
	Side (max)		-170		
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.77	3.34		
	400°C	3.23	3.81		
	500°C				
	600°C	3.54	4.2		
	800°C	3.84	4.57		

Specimen No		50			
Experiment		Pre	OC-1	OC-3	OC-5
Position			W4	N8	
Dose			9.5	32.8	
Diameter (in)	Top 0	0.4905	0.4938		
	Top 90	0.4904	0.494		
	Top 120	0.4905	0.4939		
	Top 240	0.4905	0.4939		
	Mid 0	0.4905	0.4924		
	Mid 90	0.4905	0.4924		
	Mid 120	0.4905	0.4924		
	Mid 240	0.4905	0.4924		
	Bot0	0.4904	0.4938		
	Bot 90	0.4905	0.4939		
	Bot 120	0.4905	0.494		
	Bot 240	0.4905	0.494		
Length (in)	0	0.9994	0.9718		
	120	0.9995	0.972		
	240	0.9996	0.9719		
	0	0.9994	0.9719		
Weight (gms)		5.198	5.1991		
Density (g/cm^3)		1.7238	1.7529		
Sonic Times (μg)					
	Long	11.1			
	Shear (max)	17.4			
	Shear (min)	17.3			
Eddy Current (μΩ-m)					
	Top		-123		
	Bottom		-139		
	Side (max)		-176		
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.65			
	400°C	3.28			
	500°C				
	600°C	3.59			
	800°C	3.86			

Specimen No		51			
Experiment		Pre	OC-1	OC-3	OC-5
Position			E10	E10	E10
Dose			10.3	33.2	47.3
Diameter (in)	Top 0	0.4903	0.4918		
	Top 90	0.4903	0.4918		
	Top 120	0.4903	0.4919		
	Top 240	0.4903	0.4918		
	Mid 0	0.4903	0.4909		
	Mid 90	0.4904	0.491		
	Mid 120	0.4903	0.491		
	Mid 240	0.4902	0.4909		
	Bot0	0.4905	0.4916		
	Bot 90	0.4904	0.4915		
	Bot 120	0.4904	0.4914		
	Bot 240	0.4904	0.4917		
Length (in)	0	1.0004	0.9895		
	120	1.0004	0.9893		
	240	1.0004	0.9895		
	0	1.0001	0.9895		
Weight (gms)		5.1937	5.1944		
Density (g/cm^3)		1.7219	1.7336		
Sonic Times (μg)					
	Long	11.1			
	Shear (max)	17.5			
	Shear (min)	17.4			
Eddy Current (μΩ-m)					
	Top		-125	-132	-201
	Bottom		-132	-137	-203
	Side (max)		-181	-227	-277
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C		3.44	3.85	
	400°C		3.71	4.2	
	500°C			4.29	
	600°C		4.28	4.42	
	800°C		4.71	4.19	

Specimen No	52				
Experiment		Pre	OC-1	OC-3	OC-5
Position			W10	W10	W10
Dose			10.3	33.2	47.3
Diameter (in)	Top 0	0.4904	0.494		
	Top 90	0.4904	0.4939		
	Top 120	0.4905	0.4939		
	Top 240	0.4904	0.4941		
	Mid 0	0.4905	0.4922		
	Mid 90	0.4905	0.4923		
	Mid 120	0.4905	0.4923		
	Mid 240	0.4905	0.4923		
	Bot0	0.4907	0.4938		
	Bot 90	0.4906	0.494		
	Bot 120	0.4907	0.4938		
	Bot 240	0.4907	0.494		
Length (in)	0	0.999	0.9743		
	120	0.9996	0.9746		
	240	1	0.9745		
	0	0.9996	0.9743		
Weight (gms)		5.1835	5.1837		
Density (g/cm^3)		1.7184	1.7432		
Sonic Times (μg)					
	Long	11.1			
	Shear (max)	17.5			
	Shear (min)	17.4			
Eddy Current (μΩ-m)					
	Top		-124	-175	(-186)
	Bottom		-127	-173	-191
	Side (max)		-180	-235	-278
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.82	4.33	3.85	
	400°C	3.28	4.81	4	
	500°C			4.17	
	600°C	3.55	5.25	4.35	
	800°C	3.89	5.71	4.69	

Specimen No		53			
Experiment		Pre	OC-1	OC-3	OC-5
Position			E12	E12	E12
Dose			9.7	31.1	44.2
Diameter (in)	Top 0	0.4904	0.4917		
	Top 90	0.4905	0.4918		
	Top 120	0.4905	0.4918		
	Top 240	0.4903	0.4918		
	Mid 0	0.4903	0.491		
	Mid 90	0.4905	0.4911		
	Mid 120	0.4906	0.4912		
	Mid 240	0.4905	0.491		
	Bot0	0.4904	0.4915		
	Bot 90	0.4904	0.4917		
	Bot 120	0.4904	0.4916		
	Bot 240	0.4905	0.4917		
Length (in)	0	1.0001	0.99		
	120	1.0001	0.9897		
	240	1.0001	0.9899		
	0	1.0001	0.99		
Weight (gms)		5.189	5.1893		
Density (g/cm^3)		1.72	1.7307		
Sonic Times (μg)					
	Long	11.1			
	Shear (max)	17.5			
	Shear (min)	17.4			
Eddy Current (μΩ-m)					
	Top		-114	-138	-198
	Bottom		-112	-140	-200
	Side (max)		-164	-221	-273
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.75		3.65	
	400°C	3.17		4.05	
	500°C			4.19	
	600°C	3.49		4.33	
	800°C	3.82		4.56	

Specimen No		54			
Experiment		Pre	OC-1	OC-3	OC-5
Position			W12	W12	W12
Dose			9.7	31.1	44.2
Diameter (in)	Top 0	0.4902	0.4939		
	Top 90	0.4906	0.4938		
	Top 120	0.4904	0.4941		
	Top 240	0.4904	0.4938		
	Mid 0	0.4905	0.4922		
	Mid 90	0.4905	0.4923		
	Mid 120	0.4905	0.4925		
	Mid 240	0.4905	0.4923		
	Bot0	0.4904	0.4939		
	Bot 90	0.4904	0.4936		
	Bot 120	0.4904	0.4938		
	Bot 240	0.4904	0.4937		
Length (in)	0	0.9994	0.9729		
	120	0.9996	0.9732		
	240	0.9994	0.9735		
	0	0.9994	0.9729		
Weight (gms)		5.1649	5.1664		
Density (g/cm^3)		1.7132	1.7402		
Sonic Times (μg)					
	Long	10.8			
	Shear (max)	17.4			
	Shear (min)	17.3			
Eddy Current (μΩ-m)					
	Top		-118	-165	-193
	Bottom		-124	-156	-203
	Side (max)		-180	-233	-270
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.94	4.24	4.55	
	400°C	3.16	4.76	4.78	
	500°C			4.89	
	600°C	3.55	5.28	5	
	800°C	3.8	5.73	5.34	

Specimen No		76			
Experiment		Pre	OC-1	OC-3	OC-5
Position			N6	S6	S6
Dose			10.2	32.9	46.8
Diameter (in)	Top 0	0.6002	0.6003		
	Top 90	0.6004	0.6004		
	Top 120	0.6005	0.6004		
	Top 240	0.6005	0.6004		
	Mid 0	0.6	0.6004		
	Mid 90	0.6002	0.6004		
	Mid 120	0.6003	0.6004		
	Mid 240	0.6003	0.6004		
	Bot0	0.6003	0.6004		
	Bot 90	0.6003	0.6006		
	Bot 120	0.6004	0.6006		
	Bot 240	0.6004	0.6006		
Length (in)	0	1.0006	0.9998		
	120	1.0005	0.9997		
	240	1.0004	0.9997		
	0	1.0006	0.9997		
Weight (gms)		7.3397	7.3405		
Density (g/cm^3)		1.7117	1.7126		
Sonic Times (μg)					
	Long	11.1			
	Shear (max)	17.5			
	Shear (min)	17.5			
Eddy Current (μΩ-m)					
			10.35		
	Top		2.36		-269
	Bottom				-271
	Side (max)				-232
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.53	2.74	2.55	
	400°C	2.93	3.08	3.28	
	500°C			3.55	
	600°C	3.22	3.43	3.82	
	800°C	3.57	3.78	4.24	

Specimen No	77				
Experiment		Pre	OC-1	OC-3	OC-5
Position			S6		
Dose			10.2		
Diameter (in)	Top 0	0.6	0.5998		
	Top 90	0.6	0.5998		
	Top 120	0.5999	0.5999		
	Top 240	0.5999	0.5998		
	Mid 0	0.5999	0.5999		
	Mid 90	0.5998	0.5998		
	Mid 120	0.5998	0.5998		
	Mid 240	0.5998	0.6001		
	Bot0	0.5998	0.6		
	Bot 90	0.5999	0.6		
	Bot 120	0.5999	0.6		
	Bot 240	0.5999	0.6		
Length (in)	0	1.0006	0.9997		
	120	1.0002	0.9995		
	240	1.0003	0.9993		
	0	1.0006	0.9993		
Weight (gms)		7.3202	7.321		
Density (g/cm^3)		1.71	1.7119		
Sonic Times (μg)					
	Long	11.1			
	Shear (max)	17.4			
	Shear (min)	17.3			
Eddy Current (μΩ-m)					
			15.36		
	Top		2.22		
	Bottom				
	Side (max)				
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.54	2.79		
	400°C	2.93	3.06		
	500°C				
	600°C	3.3	3.52		
	800°C	3.59	3.79		

Specimen No		81			
Experiment		Pre	OC-1	OC-3	OC-5
Position			N7		
Dose			10.5		
Diameter (in)	Top 0	0.6	0.6001		
	Top 90	0.6	0.6002		
	Top 120	0.6001	0.6003		
	Top 240	0.6001	0.6002		
	Mid 0	0.5995	0.6002		
	Mid 90	0.6	0.6002		
	Mid 120	0.5998	0.6002		
	Mid 240	0.6	0.6002		
	Bot0	0.6	0.6002		
	Bot 90	0.6001	0.6003		
	Bot 120	0.6	0.6002		
	Bot 240	0.6002	0.6003		
Length (in)	0	0.9994	0.9984		
	120	0.9995	0.998		
	240	0.9997	0.9984		
	0	0.9994	0.9984		
Weight (gms)		7.3914	7.3925		
Density (g/cm^3)		1.7277	1.7283		
Sonic Times (μg)					
	Long	10.8			
	Shear (max)	17.1			
	Shear (min)	17.1			
Eddy Current (μΩ-m)					
			16.05		
	Top		2.44		
	Bottom				
	Side (max)				
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.44	2.79		
	400°C	2.93	3.06		
	500°C				
	600°C	3.27	3.42		
	800°C	3.54	3.66		

Specimen No	82				
Experiment		Pre	OC-1	OC-3	OC-5
Position			S7	S7	S7
Dose			10.5	33.8	48.11
Diameter (in)	Top 0	0.5998	0.6001		
	Top 90	0.5998	0.6002		
	Top 120	0.5998	0.6001		
	Top 240	0.5998	0.6002		
	Mid 0	0.5998	0.6		
	Mid 90	0.5999	0.6		
	Mid 120	0.5999	0.6		
	Mid 240	0.6	0.6001		
	Bot0	0.6	0.5999		
	Bot 90	0.6001	0.6		
	Bot 120	0.6001	0.6		
	Bot 240	0.6001	0.6		
Length (in)	0	1.0002	0.9991		
	120	1.0005	0.9995		
	240	1.0001	0.9997		
	0	1.0002	0.9991		
Weight (gms)		7.3846	7.3856		
Density (g/cm^3)		1.725	1.7262		
Sonic Times (μg)					
	Long	11			
	Shear (max)	17.2			
	Shear (min)	17.2			
Eddy Current (μΩ-m)			15.77		
	Top		2.39		-258
	Bottom				-256
	Side (max)				-228
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.52	2.84	2.55	
	400°C	2.91	3.16	3.28	
	500°C			3.57	
	600°C	3.2	3.47	3.88	
	800°C	3.54	3.73	4.25	

Specimen No		86			
Experiment		Pre	OC-1	OC-3	OC-5
Position			N8		N8
Dose			10.5		24.8
Diameter (in)	Top 0	0.6004	0.6005		
	Top 90	0.6004	0.6005		
	Top 120	0.6004	0.6004		
	Top 240	0.6004	0.6005		
	Mid 0	0.6002	0.6005		
	Mid 90	0.6003	0.6004		
	Mid 120	0.6003	0.6004		
	Mid 240	0.6004	0.6004		
	Bot0	0.6004	0.6004		
	Bot 90	0.6004	0.6005		
	Bot 120	0.6004	0.6004		
	Bot 240	0.6004	0.6004		
Length (in)	0	1.001	0.9999		
	120	1.0012	1.0002		
	240	1.0012	0.9996		
	0	1.001	0.9999		
Weight (gms)		7.3135	7.314		
Density (g/cm^3)		1.7042	1.7061		
Sonic Times (μg)					
	Long	10.4			
	Shear (max)	17.6			
	Shear (min)	17.3			
Eddy Current (μΩ-m)					
			16.46		
	Top		2.28		-263
	Bottom				-265
	Side (max)				-232
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.9	3.14		
	400°C	3.26	3.58		
	500°C				
	600°C	3.69	4		
	800°C	4.09	4.28		

Specimen No		87			
Experiment		Pre	OC-1	OC-3	OC-5
Position			S8	S8	S8
Dose			10.5	33.8	48.1
Diameter (in)	Top 0	0.5995	0.5996		
	Top 90	0.5995	0.5996		
	Top 120	0.5995	0.5997		
	Top 240	0.5995	0.5996		
	Mid 0	0.5995	0.5997		
	Mid 90	0.5995	0.5996		
	Mid 120	0.5995	0.5995		
	Mid 240	0.5995	0.5996		
	Bot0	0.5995	0.5996		
	Bot 90	0.5995	0.5996		
	Bot 120	0.5995	0.5996		
	Bot 240	0.5995	0.5996		
Length (in)	0	1.0006	0.9995		
	120	1.0005	0.9998		
	240	1.0009	0.9995		
	0	1.0006	0.9994		
Weight (gms)		7.298	7.2891		
Density (g/cm^3)		1.7067	1.706		
Sonic Times (μg)					
	Long	11			
	Shear (max)	17.6			
	Shear (min)	17.3			
Eddy Current (μΩ-m)			16.6		
	Top		2.3		-273
	Bottom				-277
	Side (max)				-240
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	3	2.89	2.7	
	400°C	3.28	3.11	3.25	
	500°C			3.55	
	600°C	3.71	3.52	3.73	
	800°C	3.99	3.79	4.04	

Specimen No	91				
Experiment		Pre	OC-1	OC-3	OC-5
Position			N9		
Dose			10.5		
Diameter (in)	Top 0	0.6001	0.6003		
	Top 90	0.6002	0.6002		
	Top 120	0.6001	0.6003		
	Top 240	0.6002	0.6001		
	Mid 0	0.6	0.6003		
	Mid 90	0.6002	0.6001		
	Mid 120	0.6001	0.6002		
	Mid 240	0.6003	0.6005		
	Bot0	0.6	0.6		
	Bot 90	0.6001	0.6002		
	Bot 120	0.6001	0.6002		
	Bot 240	0.6002	0.6004		
Length (in)	0	1.0001	0.9994		
	120	1.0002	0.999		
	240	0.9999	0.9994		
	0	1.0001	0.9994		
Weight (gms)		7.2735	7.2742		
Density (g/cm^3)		1.6982	1.6991		
Sonic Times (μg)					
	Long	12			
	Shear (max)	19.1			
	Shear (min)	18.7			
Eddy Current (μΩ-m)					
			18.29		
	Top		2.2		
	Bottom				
	Side (max)				
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	3.03	3.67		
	400°C	3.41	4.01		
	500°C				
	600°C	3.77	4.35		
	800°C	4.13	4.68		

Specimen No		92			
Experiment		Pre	OC-1	OC-3	OC-5
Position			S9	S9	S9
Dose			10.5	33.8	48.1
Diameter (in)	Top 0	0.6003	0.6007		
	Top 90	0.6004	0.6005		
	Top 120	0.6005	0.6004		
	Top 240	0.6005	0.6006		
	Mid 0	0.6002	0.6006		
	Mid 90	0.6004	0.6005		
	Mid 120	0.6005	0.6008		
	Mid 240	0.6005	0.6004		
	Bot0	0.6003	0.6006		
	Bot 90	0.6004	0.6005		
	Bot 120	0.6005	0.6007		
	Bot 240	0.6006	0.6004		
Length (in)	0	0.9999	0.9993		
	120	0.9998	0.9992		
	240	0.9992	0.9985		
	0	0.9999	0.9982		
Weight (gms)		7.2985	7.2997		
Density (g/cm^3)		1.7029	1.7036		
Sonic Times (μg)					
	Long	12			
	Shear (max)	20.2			
	Shear (min)	19.8			
Eddy Current (μΩ-m)			19.76		
	Top		2.37		-252
	Bottom				-253
	Side (max)				-255
	Side (min)				-262
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	3.14	3.93	3.3	
	400°C	3.43	3.91	3.83	
	500°C			4.15	
	600°C	3.77	3.24	4.38	
	800°C	4.13	4.51	4.71	

Specimen No	97				
Experiment		Pre	OC-1	OC-3	OC-5
Position			3	3	3
Dose			8.95	19.8	28.8
Diameter (in)	Top 0	0.6001	0.6003		
	Top 90	0.6002	0.6003		
	Top 120	0.6001	0.6004		
	Top 240	0.6002	0.6004		
	Mid 0	0.6001	0.6002		
	Mid 90	0.6002	0.6003		
	Mid 120	0.6002	0.6003		
	Mid 240	0.6002	0.6003		
	Bot0	0.6002	0.6003		
	Bot 90	0.6002	0.6003		
	Bot 120	0.6002	0.6004		
	Bot 240	0.6002	0.6003		
Length (in)	0	1	0.9993		
	120	1	0.9993		
	240	0.9999	0.9992		
	0	1	0.9992		
Weight (gms)		7.3181	7.319		
Density (g/cm^3)		1.7085	1.7092		
Sonic Times (μg)					
	Long	11.1			
	Shear (max)	17.4			
	Shear (min)	17.5			
Eddy Current (μΩ-m)					
			15.84		
	Top		2.2		-277
	Bottom				-278
	Side (max)				-244
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.85	2.92	2.65	
	400°C	3.36	3.28	2.85	
	500°C			2.95	
	600°C	3.56	3.61	3.05	
	800°C	3.8	3.85	3.24	

Specimen No		98			
Experiment		Pre	OC-1	OC-3	OC-5
Position			S3		
Dose			8.95		
Diameter (in)	Top 0	0.6	0.6		
	Top 90	0.5999	0.6001		
	Top 120	0.5999	0.6001		
	Top 240	0.6	0.6002		
	Mid 0	0.6	0.6		
	Mid 90	0.6	0.6		
	Mid 120	0.6	0.6		
	Mid 240	0.6	0.6002		
	Bot0	0.5999	0.6		
	Bot 90	0.6	0.6001		
	Bot 120	0.6	0.6001		
	Bot 240	0.6	0.6001		
Length (in)	0	1.0003	0.9994		
	120	1.0007	0.9996		
	240	1.0007	0.9997		
	0	1.0003	0.9994		
Weight (gms)		7.2897	7.2911		
Density (g/cm^3)		1.7021	1.7037		
Sonic Times (μg)					
	Long	11.1			
	Shear (max)	17.5			
	Shear (min)	17.5			
Eddy Current (μΩ-m)					
			15.48		
	Top		2.15		
	Bottom				
	Side (max)				
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.9	3.14		
	400°C	3.21	3.31		
	500°C				
	600°C	3.39	3.78		
	800°C	3.68	4.03		

Specimen No	99				
Experiment		Pre	OC-1	OC-3	OC-5
Position			5		5
Dose			9.95		23.6
Diameter (in)	Top 0	0.6003	0.6001		
	Top 90	0.6004	0.6001		
	Top 120	0.6004	0.6002		
	Top 240	0.6003	0.6001		
	Mid 0	0.6003	0.6002		
	Mid 90	0.6004	0.6002		
	Mid 120	0.6004	0.6002		
	Mid 240	0.6004	0.6		
	Bot0	0.6003	0.6001		
	Bot 90	0.6004	0.6001		
	Bot 120	0.6003	0.6		
	Bot 240	0.6003	0.6002		
Length (in)	0	0.9994	0.9985		
	120	0.9995	0.9978		
	240	0.9989	0.9987		
	0	0.9994	0.9986		
Weight (gms)		7.2852	7.2861		
Density (g/cm^3)		1.701	1.7043		
Sonic Times (μg)					
	Long	11.2			
	Shear (max)	17.4			
	Shear (min)	17.4			
Eddy Current (μΩ-m)			16.34		
	Top		2.27		-263
	Bottom				-265
	Side (max)				240
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	3.05	2.79		
	400°C	3.46	3.01		
	500°C				
	600°C	3.61	3.42		
	800°C	3.9	3.74		

Specimen No	100				
Experiment		Pre	OC-1	OC-3	OC-5
Position			S5		
Dose			9.95		
Diameter (in)	Top 0	0.5997	0.6		
	Top 90	0.5999	0.6001		
	Top 120	0.5998	0.6		
	Top 240	0.5999	0.6		
	Mid 0	0.5999	0.6		
	Mid 90	0.5999	0.6		
	Mid 120	0.5999	0.6		
	Mid 240	0.5999	0.6		
	Bot0	0.6	0.6001		
	Bot 90	0.5999	0.6001		
	Bot 120	0.6	0.6		
	Bot 240	0.5999	0.6		
Length (in)	0	0.9999	0.9988		
	120	1.0001	0.9991		
	240	1.0001	0.9987		
	0	0.9999	0.9988		
Weight (gms)		7.2886	7.2801		
Density (g/cm^3)		1.7033	1.7026		
Sonic Times (μg)					
	Long	11.2			
	Shear (max)	17.5			
	Shear (min)	17.4			
Eddy Current (μΩ-m)					
			14.89		
	Top		2.07		
	Bottom				
	Side (max)				
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.8	2.79		
	400°C	3.45	3.13		
	500°C				
	600°C	3.68	3.55		
	800°C	4.06	3.87		

Specimen No	101				
Experiment		Pre	OC-1	OC-3	OC-5
Position			N11		N11
Dose			10		23.7
Diameter (in)	Top 0	0.6002	0.6002		
	Top 90	0.6003	0.6002		
	Top 120	0.6003	0.6002		
	Top 240	0.6003	0.6003		
	Mid 0	0.6	0.6002		
	Mid 90	0.6	0.6002		
	Mid 120	0.6	0.6002		
	Mid 240	0.6	0.6002		
	Bot0	0.6	0.6004		
	Bot 90	0.6	0.6006		
	Bot 120	0.6	0.6007		
	Bot 240	0.6	0.6006		
Length (in)	0	1.0002	0.9988		
	120	1.0003	0.9988		
	240	0.9999	0.9991		
	0	1.0002	0.9988		
Weight (gms)		7.293	7.2889		
Density (g/cm^3)		1.7028	1.7028		
Sonic Times (μg)					
	Long	11.2			
	Shear (max)	17.5			
	Shear (min)	17.5			
Eddy Current (μΩ-m)					
			16.46		
	Top		2.28		-268
	Bottom				-260
	Side (max)				-234
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.86	3.09		
	400°C	3.28	3.31		
	500°C				
	600°C	3.64	3.8		
	800°C	4.05	4.16		

Specimen No	102				
Experiment		Pre	OC-1	OC-3	OC-5
Position			S11	S11	S11
Dose			10	32.3	46
Diameter (in)	Top 0	0.6002	0.6005		
	Top 90	0.6002	0.6004		
	Top 120	0.6002	0.6004		
	Top 240	0.6002	0.6004		
	Mid 0	0.6002	0.6004		
	Mid 90	0.6002	0.6004		
	Mid 120	0.6002	0.6004		
	Mid 240	0.6002	0.6005		
	Bot0	0.6002	0.6005		
	Bot 90	0.6002	0.6004		
	Bot 120	0.6002	0.6004		
	Bot 240	0.6002	0.6004		
Length (in)	0	0.9997	0.9985		
	120	0.9995	0.9984		
	240	0.9996	0.9984		
	0	0.9997	0.9985		
Weight (gms)		7.2936	7.2947		
Density (g/cm^3)		1.7033	1.7043		
Sonic Times (μg)					
	Long	11.2			
	Shear (max)	17.5			
	Shear (min)	17.4			
Eddy Current (μΩ-m)			15.54		
	Top		2.16		-282
	Bottom				-281
	Side (max)				-242
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.86	2.74		
	400°C	3.23	2.96		
	500°C				
	600°C	3.54	3.38		
	800°C	3.88	3.69		

Specimen No	109				
Experiment		Pre	OC-1	OC-3	OC-5
Position			N1		
Dose			7.52		
Diameter (in)	Top 0	0.6003	0.6003		
	Top 90	0.6004	0.6003		
	Top 120	0.6003	0.6004		
	Top 240	0.6004	0.6003		
	Mid 0	0.6004	0.6003		
	Mid 90	0.6004	0.6003		
	Mid 120	0.6004	0.6003		
	Mid 240	0.6004	0.6003		
	Bot0	0.6004	0.6003		
	Bot 90	0.6005	0.6002		
	Bot 120	0.6004	0.6002		
	Bot 240	0.6005	0.6003		
Length (in)	0	1	0.9991		
	120	1	0.9994		
	240	1	0.9987		
	0	0.9999	0.999		
Weight (gms)		7.2851	7.2876		
Density (g/cm^3)		1.6994	1.7024		
Sonic Times (μg)					
	Long	11.2			
	Shear (max)	17.6			
	Shear (min)	17.5			
Eddy Current (μΩ-m)					
			14.26		
	Top		1.85		
	Bottom				
	Side (max)				
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.86	2.89		
	400°C	3.43	3.23		
	500°C				
	600°C	3.7	3.57		
	800°C	4.1	3.89		

Specimen No	111				
Experiment		Pre	OC-1	OC-3	OC-5
Position			S1	S1	S1
Dose			7.52	24.2	34.4
Diameter (in)	Top 0	0.6001	0.6		
	Top 90	0.6003	0.6		
	Top 120	0.6002	0.6		
	Top 240	0.6002	0.6		
	Mid 0	0.6003	0.6		
	Mid 90	0.6002	0.6		
	Mid 120	0.6002	0.6		
	Mid 240	0.6001	0.6		
	Bot0	0.6001	0.6		
	Bot 90	0.6002	0.6001		
	Bot 120	0.6002	0.6		
	Bot 240	0.6002	0.6		
Length (in)	0	1.0003	0.9994		
	120	1	0.9992		
	240	1.0005	0.9996		
	0	1.0003	0.9994		
Weight (gms)		7.2943	7.2969		
Density (g/cm^3)		1.7023	1.7057		
Sonic Times (μg)					
	Long	11.1			
	Shear (max)	17.5			
	Shear (min)	17.6			
Eddy Current (μΩ-m)			11.48		
	Top		1.59		-268
	Bottom				-257
	Side (max)				-238
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.86	2.69	2.6	
	400°C	3.28	3.23	2.68	
	500°C			2.67	
	600°C	3.61	3.5	2.77	
	800°C	3.99	3.81	3.08	

Specimen No	113				
Experiment		Pre	OC-1	OC-3	OC-5
Position			S4		
Dose			9.52		
Diameter (in)	Top 0	0.6003	0.6004		
	Top 90	0.6003	0.6004		
	Top 120	0.6003	0.6004		
	Top 240	0.6003	0.6005		
	Mid 0	0.6003	0.6004		
	Mid 90	0.6003	0.6004		
	Mid 120	0.6003	0.6004		
	Mid 240	0.6003	0.6004		
	Bot0	0.6003	0.6005		
	Bot 90	0.6003	0.6004		
	Bot 120	0.6003	0.6006		
	Bot 240	0.6003	0.6006		
Length (in)	0	1.0003	0.9994		
	120	0.9998	0.9989		
	240	1.0002	0.9994		
	0	1.0003	0.9994		
Weight (gms)		7.3696	7.3714		
Density (g/cm^3)		1.7194	1.7206		
Sonic Times (μg)					
	Long	11.1			
	Shear (max)	17.2			
	Shear (min)	17.2			
Eddy Current (μΩ-m)					
			13.38		
	Top		1.86		
	Bottom				
	Side (max)				
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.8	3.4		
	400°C	3.26	3.36		
	500°C				
	600°C	3.53	3.92		
	800°C	3.89	4.21		

Specimen No	114				
Experiment		Pre	OC-1	OC-3	OC-5
Position			N10		N10
Dose			10.3		24.4
Diameter (in)	Top 0	0.5997	0.6001		
	Top 90	0.5999	0.6002		
	Top 120	0.5998	0.6002		
	Top 240	0.6	0.6001		
	Mid 0	0.5999	0.6001		
	Mid 90	0.5999	0.6001		
	Mid 120	0.6	0.6002		
	Mid 240	0.5999	0.6001		
	Bot0	0.6	0.5999		
	Bot 90	0.5999	0.6001		
	Bot 120	0.6	0.6001		
	Bot 240	0.5999	0.6002		
Length (in)	0	1.0005	0.9993		
	120	1.001	0.9997		
	240	1.0009	0.9995		
	0	1.0005	0.9992		
Weight (gms)		7.3555	7.3563		
Density (g/cm^3)		1.7175	1.7188		
Sonic Times (μg)					
	Long	11.1			
	Shear (max)	17.3			
	Shear (min)	17.2			
Eddy Current (μΩ-m)			15.83		
	Top		2.2		-242
	Bottom				-244
	Side (max)				-228
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.7	2.99		
	400°C	3.26	3.33		
	500°C				
	600°C	3.43	3.73		
	800°C	3.78	4.04		

Specimen No	115				
Experiment		Pre	OC-1	OC-3	OC-5
Position			S10	S10	S10
Dose			10.3	33.2	47.3
Diameter (in)	Top 0	0.6	0.6003		
	Top 90	0.6001	0.6003		
	Top 120	0.6001	0.6002		
	Top 240	0.6001	0.6003		
	Mid 0	0.6	0.6002		
	Mid 90	0.6001	0.6003		
	Mid 120	0.6001	0.6003		
	Mid 240	0.6002	0.6003		
	Bot0	0.6	0.6001		
	Bot 90	0.6001	0.6002		
	Bot 120	0.6001	0.6002		
	Bot 240	0.6002	0.6002		
Length (in)	0	1.0007	0.9991		
	120	1.0002	0.999		
	240	1.0004	0.9982		
	0	1.0007	0.9991		
Weight (gms)		7.3697	7.371		
Density (g/cm^3)		1.72	1.7225		
Sonic Times (μg)					
	Long	11.1			
	Shear (max)	17.2			
	Shear (min)	17.2			
Eddy Current (μΩ-m)			18.02		
	Top		2.5		-261
	Bottom				-264
	Side (max)				-233
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.7	2.84		
	400°C	3.26	3.16		
	500°C				
	600°C	3.56	3.57		
	800°C	3.93	3.92		

Specimen No	116				
Experiment		Pre	OC-1	OC-3	OC-5
Position			N12		
Dose			9.7		
Diameter (in)	Top 0	0.5999	0.6		
	Top 90	0.5998	0.6		
	Top 120	0.5998	0.6001		
	Top 240	0.5999	0.6		
	Mid 0	0.5998	0.6		
	Mid 90	0.5999	0.6		
	Mid 120	0.5999	0.6001		
	Mid 240	0.5999	0.6002		
	Bot0	0.5999	0.6001		
	Bot 90	0.5999	0.6001		
	Bot 120	0.5999	0.6		
	Bot 240	0.5999	0.6001		
Length (in)	0	1.0019	1.0006		
	120	1.0017	1.0002		
	240	1.0013	1.0003		
	0	1.0019	1.0006		
Weight (gms)		7.355	7.356		
Density (g/cm^3)		1.7158	1.7172		
Sonic Times (μg)					
	Long	10.9			
	Shear (max)	17.2			
	Shear (min)	17.2			
Eddy Current (μΩ-m)			15.27		
	Top		2.12		
	Bottom				
	Side (max)				
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.8	3.04		
	400°C	3.23	3.28		
	500°C				
	600°C	3.59	3.83		
	800°C	3.97	4.16		

Specimen No	117				
Experiment		Pre	OC-1	OC-3	OC-5
Position			S12	S12	S12
Dose			9.66	31.1	44.2
Diameter (in)	Top 0	0.6	0.6002		
	Top 90	0.6	0.6001		
	Top 120	0.5999	0.6001		
	Top 240	0.5999	0.6001		
	Mid 0	0.6001	0.6003		
	Mid 90	0.6	0.6002		
	Mid 120	0.5999	0.6001		
	Mid 240	0.5999	0.6001		
	Bot0	0.5999	0.6003		
	Bot 90	0.6	0.6003		
	Bot 120	0.5999	0.6003		
	Bot 240	0.5999	0.6003		
Length (in)	0	1.0006	0.9996		
	120	1.0003	0.9998		
	240	1.0007	0.9993		
	0	1.0006	0.9996		
Weight (gms)		7.2997	7.3012		
Density (g/cm^3)		1.7045	1.7051		
Sonic Times (μg)					
	Long	11.1			
	Shear (max)	17.5			
	Shear (min)	17.5			
Eddy Current (μΩ-m)					
	Top	14.24	1.98		-279
	Bottom				-267
	Side (max)				-243
	Side (min)				
CTE ($^oC^{-1}$ 10^{-6})					
	200°C	2.75	2.99		
	400°C	3.18	3.23		
	500°C				
	600°C	3.49	3.62		
	800°C	3.87	3.96		

Appendix B Dilatometer Archive Data

OC3 Dilatometer Data

Capsule	OC3	Specimen Length	3 0.9784	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.98***	***1.20***	0	0.9784					0	0.9784				
100	***1.07***	***1.20***	0	0.9784	0.00E+00	***5.50E-07***	5.50E-07	5.00E-07	0.09	0.9785	9.20E-07	***1.45E-06***	5.30E-07	1.42E-06
200	***1.18***	***1.22***	0.02	0.9784	1.02E-07	***6.50E-07***	5.48E-07	6.02E-07	0.2	0.9786	1.02E-06	***1.55E-06***	5.28E-07	1.52E-06
300	***1.27***	***1.23***	0.03	0.9784	1.02E-07	***6.50E-07***	5.48E-07	6.02E-07	0.29	0.9787	9.88E-07	***1.52E-06***	5.28E-07	1.49E-06
400	***1.36***	***1.32***	0.12	0.9785	3.07E-07	***8.50E-07***	5.43E-07	8.07E-07	0.38	0.9788	9.71E-07	***1.50E-06***	5.29E-07	1.47E-06
500	***1.50***	***1.50***	0.3	0.9787	6.13E-07	***1.15E-06***	5.37E-07	1.11E-06	0.52	0.9789	1.06E-06	***1.59E-06***	5.27E-07	1.56E-06
600	***1.64***	***1.68***	0.48	0.9789	8.18E-07	***1.35E-06***	5.32E-07	1.32E-06	0.66	0.9791	1.12E-06	***1.65E-06***	5.26E-07	1.62E-06
700	***1.80***	***1.89***	0.69	0.9791	1.01E-06	***1.54E-06***	5.28E-07	1.51E-06	0.82	0.9792	1.20E-06	***1.72E-06***	5.24E-07	1.70E-06
800	***2.08***	***2.11***	0.91	0.9793	1.16E-06	***1.69E-06***	5.24E-07	1.66E-06	1.1	0.9795	1.41E-06	***1.93E-06***	5.20E-07	1.91E-06

Capsule	OC3	Specimen Length	3G 0.9899	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.90***	***-0.60***	0	0.9899					0	0.9899				
100	***1.05***	***0.79***	1.39	0.9913	1.40E-05	***2.45E-06***	-1.16E-05	-1.16E-05	0.15	0.9901	1.52E-06	***2.05E-06***	5.35E-07	2.02E-06
200	***1.20***	***1.00***	1.6	0.9915	8.08E-06	***2.55E-06***	-5.53E-06	-5.53E-06	0.3	0.9902	1.52E-06	***2.05E-06***	5.35E-07	2.02E-06
300	***1.32***	***1.20***	1.8	0.9917	6.06E-06	***2.55E-06***	-3.51E-06	-3.51E-06	0.42	0.9903	1.41E-06	***1.95E-06***	5.36E-07	1.91E-06
400	***1.53***	***1.45***	2.05	0.9920	5.18E-06	***2.68E-06***	-2.50E-06	-2.50E-06	0.63	0.9905	1.59E-06	***2.13E-06***	5.34E-07	2.09E-06
500	***1.78***	***1.70***	2.3	0.9922	4.65E-06	***2.75E-06***	-1.90E-06	-1.90E-06	0.88	0.9908	1.78E-06	***2.31E-06***	5.32E-07	2.28E-06
600	***2.04***	***1.96***	2.56	0.9925	4.31E-06	***2.82E-06***	-1.49E-06	-1.49E-06	1.14	0.9910	1.92E-06	***2.45E-06***	5.31E-07	2.42E-06
700	***2.32***	***2.25***	2.85	0.9928	4.11E-06	***2.91E-06***	-1.21E-06	-1.21E-06	1.42	0.9913	2.05E-06	***2.58E-06***	5.29E-07	2.55E-06
800	***2.63***	***2.54***	3.14	0.9930	3.97E-06	***2.98E-06***	-9.90E-07	-9.90E-07	1.73	0.9916	2.18E-06	***2.71E-06***	5.27E-07	2.68E-06

Capsule	OC3	Specimen Length	4G 0.9934	Scale	1"	1.00E-03							
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.09***	***0.90***	0	0.9934					0	0.9934				
100	***1.15***	***0.99***	0.09	0.9935	9.06E-07	***1.45E-06***	5.44E-07	1.41E-06	0.06	0.9935	6.04E-07	***1.15E-06***	5.46E-07	1.10E-06
200	***1.22***	***1.06***	0.16	0.9936	8.05E-07	***1.35E-06***	5.45E-07	1.31E-06	0.13	0.9935	6.54E-07	***1.20E-06***	5.46E-07	1.15E-06
300	***1.29***	***1.16***	0.26	0.9937	8.72E-07	***1.42E-06***	5.44E-07	1.37E-06	0.2	0.9936	6.71E-07	***1.22E-06***	5.45E-07	1.17E-06
400	***1.38***	***1.27***	0.37	0.9938	9.31E-07	***1.48E-06***	5.44E-07	1.43E-06	0.29	0.9937	7.30E-07	***1.28E-06***	5.45E-07	1.23E-06
500	***1.50***	***1.40***	0.5	0.9939	1.01E-06	***1.55E-06***	5.43E-07	1.51E-06	0.41	0.9938	8.25E-07	***1.37E-06***	5.45E-07	1.33E-06
600	***1.62***	***1.53***	0.63	0.9940	1.06E-06	***1.60E-06***	5.43E-07	1.56E-06	0.53	0.9939	8.89E-07	***1.43E-06***	5.44E-07	1.39E-06
700	***1.78***	***1.72***	0.82	0.9942	1.18E-06	***1.72E-06***	5.42E-07	1.68E-06	0.69	0.9941	9.92E-07	***1.54E-06***	5.43E-07	1.49E-06
800	***2.00***	***1.94***	1.04	0.9944	1.31E-06	***1.85E-06***	5.41E-07	1.81E-06	0.91	0.9943	1.15E-06	***1.69E-06***	5.42E-07	1.65E-06

Capsule	OC3	Specimen Length	5 0.9868	Scale	1"	1.00E-03							
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.90***	***1.02***	0	0.9868					0	0.9868				
100	***1.00***	***1.09***	0.07	0.9869	7.09E-07	***1.25E-06***	5.41E-07	1.21E-06	0.1	0.9869	1.01E-06	***1.55E-06***	5.37E-07	1.51E-06
200	***1.14***	***1.20***	0.18	0.9870	9.12E-07	***1.45E-06***	5.38E-07	1.41E-06	0.24	0.9870	1.22E-06	***1.75E-06***	5.34E-07	1.72E-06
300	***1.30***	***1.33***	0.31	0.9871	1.05E-06	***1.58E-06***	5.36E-07	1.55E-06	0.4	0.9872	1.35E-06	***1.88E-06***	5.32E-07	1.85E-06
400	***1.45***	***1.51***	0.49	0.9873	1.24E-06	***1.78E-06***	5.34E-07	1.74E-06	0.55	0.9874	1.39E-06	***1.93E-06***	5.32E-07	1.89E-06
500	***1.61***	***1.73***	0.71	0.9875	1.44E-06	***1.97E-06***	5.31E-07	1.94E-06	0.71	0.9875	1.44E-06	***1.97E-06***	5.31E-07	1.94E-06
600	***1.84***	***1.98***	0.96	0.9878	1.62E-06	***2.15E-06***	5.29E-07	2.12E-06	0.94	0.9877	1.59E-06	***2.12E-06***	5.28E-07	2.09E-06
700	***2.17***	***2.22***	1.2	0.9880	1.74E-06	***2.26E-06***	5.27E-07	2.24E-06	1.27	0.9881	1.84E-06	***2.36E-06***	5.25E-07	2.34E-06
800	***2.52***	***2.57***	1.55	0.9884	1.96E-06	***2.49E-06***	5.24E-07	2.46E-06	1.62	0.9884	2.05E-06	***2.58E-06***	5.23E-07	2.55E-06

Capsule	OC3	Specimen Length	7											
			0.9801	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.00***	***1.35***	0	0.9801					0	0.9801				
100	***1.30***	***1.57***	0.22	0.9803	2.24E-06	***2.45E-06***	2.75E-06	2.74E-06	0.3	0.9804	3.06E-06	***3.55E-06***	4.89E-07	3.56E-06
200	***1.60***	***1.78***	0.43	0.9805	2.19E-06	***2.55E-06***	2.70E-06	2.69E-06	0.6	0.9807	3.06E-06	***3.55E-06***	4.89E-07	3.56E-06
300	***1.95***	***2.01***	0.66	0.9808	2.24E-06	***2.55E-06***	2.75E-06	2.74E-06	0.95	0.9811	3.23E-06	***3.72E-06***	4.85E-07	3.73E-06
400	***2.30***	***2.30***	0.95	0.9811	2.42E-06	***2.68E-06***	2.93E-06	2.92E-06	1.3	0.9814	3.32E-06	***3.80E-06***	4.84E-07	3.82E-06
500	***2.64***	***2.68***	1.33	0.9814	2.71E-06	***2.75E-06***	3.21E-06	3.21E-06	1.64	0.9817	3.35E-06	***3.83E-06***	4.83E-07	3.85E-06
600	***3.01***	***3.08***	1.73	0.9818	2.94E-06	***2.82E-06***	3.43E-06	3.44E-06	2.01	0.9821	3.42E-06	***3.90E-06***	4.82E-07	3.92E-06
700	***3.54***	***3.53***	2.18	0.9823	3.18E-06	***2.91E-06***	3.66E-06	3.68E-06	2.54	0.9826	3.70E-06	***4.18E-06***	4.76E-07	4.20E-06
800	***4.01***	***4.07***	2.72	0.9828	3.47E-06	***2.98E-06***	3.95E-06	3.97E-06	3.01	0.9831	3.84E-06	***4.31E-06***	4.73E-07	4.34E-06

Capsule	OC3	Specimen Length	8											
			0.9705	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.79***	***0.59***	0	0.9705					0	0.9705				
100	***1.04***	***0.86***	0.27	0.9708	2.78E-06	***4.45E-06***	1.67E-06	3.28E-06	0.25	0.9708	2.58E-06	***4.55E-06***	1.97E-06	3.08E-06
200	***1.33***	***1.19***	0.6	0.9711	3.09E-06	***4.60E-06***	1.51E-06	3.59E-06	0.54	0.9710	2.78E-06	***4.65E-06***	1.87E-06	3.28E-06
300	***1.64***	***1.51***	0.92	0.9714	3.16E-06	***4.65E-06***	1.49E-06	3.66E-06	0.85	0.9714	2.92E-06	***4.72E-06***	1.80E-06	3.42E-06
400	***1.98***	***1.90***	1.31	0.9718	3.37E-06	***4.73E-06***	1.35E-06	3.87E-06	1.19	0.9717	3.07E-06	***4.78E-06***	1.71E-06	3.57E-06
500	***2.40***	***2.31***	1.72	0.9722	3.54E-06	***4.85E-06***	1.31E-06	4.04E-06	1.61	0.9721	3.32E-06	***4.89E-06***	1.57E-06	3.82E-06
600	***2.89***	***2.81***	2.22	0.9727	3.81E-06	***4.98E-06***	1.17E-06	4.31E-06	2.1	0.9726	3.61E-06	***5.00E-06***	1.39E-06	4.11E-06
700	***3.40***	***3.40***	2.81	0.9733	4.14E-06	***5.15E-06***	1.01E-06	4.64E-06	2.61	0.9731	3.84E-06	***5.16E-06***	1.32E-06	4.34E-06
800	***4.02***	***4.07***	3.48	0.9740	4.48E-06	***5.33E-06***	8.43E-07	4.98E-06	3.23	0.9737	4.16E-06	***5.34E-06***	1.18E-06	4.66E-06

Capsule	OC3	Specimen	13											
		Length	0.9805	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.08***	***1.19***	0	0.9805					0	0.9805				
100	***1.33***	***1.44***	0.25	0.9808	2.55E-06	***3.05E-06***	5.00E-07	3.05E-06	0.25	0.9808	2.55E-06	***3.05E-06***	5.00E-07	3.05E-06
200	***1.60***	***1.72***	0.53	0.9810	2.70E-06	***3.20E-06***	4.97E-07	3.20E-06	0.52	0.9810	2.65E-06	***3.15E-06***	4.98E-07	3.15E-06
300	***1.89***	***2.00***	0.81	0.9813	2.75E-06	***3.25E-06***	4.96E-07	3.25E-06	0.81	0.9813	2.75E-06	***3.25E-06***	4.96E-07	3.25E-06
400	***2.20***	***2.31***	1.12	0.9816	2.86E-06	***3.35E-06***	4.94E-07	3.36E-06	1.12	0.9816	2.86E-06	***3.35E-06***	4.94E-07	3.36E-06
500	***2.53***	***2.69***	1.5	0.9820	3.06E-06	***3.55E-06***	4.90E-07	3.56E-06	1.45	0.9820	2.96E-06	***3.45E-06***	4.92E-07	3.46E-06
600	***2.89***	***3.08***	1.89	0.9824	3.21E-06	***3.70E-06***	4.87E-07	3.71E-06	1.81	0.9823	3.08E-06	***3.57E-06***	4.89E-07	3.58E-06
700	***3.29***	***3.47***	2.28	0.9828	3.32E-06	***3.81E-06***	4.85E-07	3.82E-06	2.21	0.9827	3.22E-06	***3.71E-06***	4.87E-07	3.72E-06
800	***3.70***	***3.85***	2.66	0.9832	3.39E-06	***3.88E-06***	4.84E-07	3.89E-06	2.62	0.9831	3.34E-06	***3.83E-06***	4.85E-07	3.84E-06

Capsule	OC3	Specimen	14	(check)										
		Length	0.9747	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.71***	***1.62***	0	0.9747					0	0.9747				
100	***1.03***	***1.28***	-0.34	0.9744	-3.49E-06	***3.15E-06***	6.64E-06	-2.99E-06	0.32	0.9750	3.28E-06	***3.75E-06***	4.67E-07	3.78E-06
200	***1.38***	***1.57***	-0.05	0.9747	-2.56E-07	***3.30E-06***	3.56E-06	2.44E-07	0.67	0.9754	3.44E-06	***3.90E-06***	4.63E-07	3.94E-06
300	***1.73***	***1.88***	0.26	0.9750	8.89E-07	***3.42E-06***	2.53E-06	1.39E-06	1.02	0.9757	3.49E-06	***3.95E-06***	4.62E-07	3.99E-06
400	***2.03***	***2.21***	0.59	0.9753	1.51E-06	***3.53E-06***	2.01E-06	2.01E-06	1.32	0.9760	3.39E-06	***3.85E-06***	4.64E-07	3.89E-06
500	***2.42***	***2.61***	0.99	0.9757	2.03E-06	***3.73E-06***	1.70E-06	2.53E-06	1.71	0.9764	3.51E-06	***3.97E-06***	4.61E-07	4.01E-06
600	***2.89***	***3.02***	1.4	0.9761	2.39E-06	***3.88E-06***	1.49E-06	2.89E-06	2.18	0.9769	3.73E-06	***4.18E-06***	4.55E-07	4.23E-06
700	***3.32***	***3.49***	1.87	0.9766	2.74E-06	***4.08E-06***	1.34E-06	3.24E-06	2.61	0.9773	3.83E-06	***4.28E-06***	4.53E-07	4.33E-06
800	***3.78***	***3.93***	2.31	0.9770	2.96E-06	***4.19E-06***	1.22E-06	3.46E-06	3.07	0.9778	3.94E-06	***4.39E-06***	4.50E-07	4.44E-06

Capsule	OC3	Specimen	18											
		Length	0.9827	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.95***	***1.28***	0	0.9827					0	0.9827				
100	***1.26***	***1.53***	0.25	0.9830	2.54E-06	***3.05E-06***	5.06E-07	3.04E-06	0.31	0.9830	3.15E-06	***3.65E-06***	4.95E-07	3.65E-06
200	***1.55***	***1.78***	0.5	0.9832	2.54E-06	***3.05E-06***	5.06E-07	3.04E-06	0.6	0.9833	3.05E-06	***3.55E-06***	4.97E-07	3.55E-06
300	***1.91***	***2.03***	0.75	0.9835	2.54E-06	***3.05E-06***	5.06E-07	3.04E-06	0.96	0.9837	3.26E-06	***3.75E-06***	4.94E-07	3.76E-06
400	***2.25***	***2.31***	1.03	0.9837	2.62E-06	***3.13E-06***	5.05E-07	3.12E-06	1.3	0.9840	3.31E-06	***3.80E-06***	4.93E-07	3.81E-06
500	***2.60***	***2.69***	1.41	0.9841	2.87E-06	***3.37E-06***	5.00E-07	3.37E-06	1.65	0.9844	3.36E-06	***3.85E-06***	4.92E-07	3.86E-06
600	***2.97***	***3.05***	1.77	0.9845	3.00E-06	***3.50E-06***	4.98E-07	3.50E-06	2.02	0.9847	3.43E-06	***3.92E-06***	4.90E-07	3.93E-06
700	***3.33***	***3.43***	2.15	0.9849	3.13E-06	***3.62E-06***	4.96E-07	3.63E-06	2.38	0.9851	3.46E-06	***3.95E-06***	4.90E-07	3.96E-06
800	***3.73***	***3.83***	2.55	0.9853	3.24E-06	***3.74E-06***	4.93E-07	3.74E-06	2.78	0.9855	3.54E-06	***4.03E-06***	4.89E-07	4.04E-06

Capsule	OC3	Specimen	19											
		Length	0.98781	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.86***	***0.86***	0	0.9878					0	0.9878				
100	***1.09***	***1.09***	0.23	0.9880	2.33E-06	***2.85E-06***	5.22E-07	2.83E-06	0.23	0.9880	2.33E-06	***2.85E-06***	5.22E-07	2.83E-06
200	***1.35***	***1.37***	0.51	0.9883	2.58E-06	***3.10E-06***	5.19E-07	3.08E-06	0.49	0.9883	2.48E-06	***3.00E-06***	5.20E-07	2.98E-06
300	***1.63***	***1.69***	0.83	0.9886	2.80E-06	***3.32E-06***	5.15E-07	3.30E-06	0.77	0.9886	2.60E-06	***3.12E-06***	5.18E-07	3.10E-06
400	***1.93***	***2.00***	1.14	0.9890	2.89E-06	***3.40E-06***	5.15E-07	3.39E-06	1.07	0.9889	2.71E-06	***3.23E-06***	5.17E-07	3.21E-06
500	***2.26***	***2.38***	1.52	0.9893	3.08E-06	***3.59E-06***	5.12E-07	3.58E-06	1.4	0.9892	2.83E-06	***3.35E-06***	5.15E-07	3.33E-06
600	***2.64***	***2.79***	1.93	0.9897	3.26E-06	***3.77E-06***	5.10E-07	3.76E-06	1.78	0.9896	3.00E-06	***3.52E-06***	5.13E-07	3.50E-06
700	***3.02***	***3.18***	2.32	0.9901	3.36E-06	***3.86E-06***	5.09E-07	3.86E-06	2.16	0.9900	3.12E-06	***3.64E-06***	5.11E-07	3.62E-06
800	***3.50***	***3.57***	2.71	0.9905	3.43E-06	***3.94E-06***	5.08E-07	3.93E-06	2.64	0.9905	3.34E-06	***3.85E-06***	5.09E-07	3.84E-06

Capsule	OC3	Specimen	23											
		Length	0.9802	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.15***	***1.45***	0	0.9802					0	0.9802				
100	***1.40***	***1.69***	0.24	0.9804	2.45E-06	***2.95E-06***	5.02E-07	2.95E-06	0.25	0.9805	2.55E-06	***3.05E-06***	5.00E-07	3.05E-06
200	***1.69***	***1.91***	0.46	0.9807	2.35E-06	***2.85E-06***	5.04E-07	2.85E-06	0.54	0.9807	2.75E-06	***3.25E-06***	4.95E-07	3.25E-06
300	***2.04***	***2.20***	0.75	0.9810	2.55E-06	***3.05E-06***	5.00E-07	3.05E-06	0.89	0.9811	3.03E-06	***3.52E-06***	4.89E-07	3.53E-06
400	***2.31***	***2.46***	1.01	0.9812	2.58E-06	***3.08E-06***	4.99E-07	3.08E-06	1.16	0.9814	2.96E-06	***3.45E-06***	4.91E-07	3.46E-06
500	***2.64***	***2.79***	1.34	0.9815	2.73E-06	***3.23E-06***	4.96E-07	3.23E-06	1.49	0.9817	3.04E-06	***3.53E-06***	4.90E-07	3.54E-06
600	***2.95***	***3.12***	1.67	0.9819	2.84E-06	***3.33E-06***	4.93E-07	3.34E-06	1.8	0.9820	3.06E-06	***3.55E-06***	4.89E-07	3.56E-06
700	***3.36***	***3.50***	2.05	0.9823	2.99E-06	***3.48E-06***	4.90E-07	3.49E-06	2.21	0.9824	3.22E-06	***3.71E-06***	4.86E-07	3.72E-06
800	***3.70***	***3.83***	2.38	0.9826	3.04E-06	***3.53E-06***	4.90E-07	3.54E-06	2.55	0.9828	3.25E-06	***3.74E-06***	4.85E-07	3.75E-06

Capsule	OC3	Specimen	24											
		Length	0.9748	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.92***	***1.10***	0	0.9748					0	0.9748				
100	***1.20***	***1.40***	0.3	0.9751	3.08E-06	***3.55E-06***	4.72E-07	3.58E-06	0.28	0.9751	2.87E-06	***3.35E-06***	4.78E-07	3.37E-06
200	***1.60***	***1.71***	0.61	0.9754	3.13E-06	***3.60E-06***	4.71E-07	3.63E-06	0.68	0.9755	3.49E-06	***3.95E-06***	4.62E-07	3.99E-06
300	***1.98***	***2.08***	0.98	0.9758	3.35E-06	***3.82E-06***	4.65E-07	3.85E-06	1.06	0.9759	3.62E-06	***4.08E-06***	4.58E-07	4.12E-06
400	***2.30***	***2.43***	1.33	0.9761	3.41E-06	***3.88E-06***	4.64E-07	3.91E-06	1.38	0.9762	3.54E-06	***4.00E-06***	4.61E-07	4.04E-06
500	***2.72***	***2.83***	1.73	0.9765	3.55E-06	***4.01E-06***	4.61E-07	4.05E-06	1.8	0.9766	3.69E-06	***4.15E-06***	4.57E-07	4.19E-06
600	***3.15***	***3.28***	2.18	0.9770	3.73E-06	***4.18E-06***	4.56E-07	4.23E-06	2.23	0.9770	3.81E-06	***4.27E-06***	4.53E-07	4.31E-06
700	***3.58***	***3.70***	2.6	0.9774	3.81E-06	***4.26E-06***	4.54E-07	4.31E-06	2.66	0.9775	3.90E-06	***4.35E-06***	4.52E-07	4.40E-06
800	***4.08***	***4.12***	3.02	0.9778	3.87E-06	***4.33E-06***	4.52E-07	4.37E-06	3.16	0.9780	4.05E-06	***4.50E-06***	4.48E-07	4.55E-06

Capsule	OC3	Specimen	25											
		Length	0.9834	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.47***	***0.47***	0	0.9834					0	0.9834				
100	***0.70***	***0.66***	0.19	0.9836	1.93E-06	***1.75E-06***	-1.82E-07	2.43E-06	0.23	0.9836	2.34E-06	***2.45E-06***	1.11E-07	2.84E-06
200	***0.92***	***0.87***	0.4	0.9838	2.03E-06	***1.75E-06***	-2.84E-07	2.53E-06	0.45	0.9839	2.29E-06	***2.35E-06***	6.20E-08	2.79E-06
300	***1.19***	***1.10***	0.63	0.9840	2.14E-06	***1.82E-06***	-3.19E-07	2.64E-06	0.72	0.9841	2.44E-06	***2.42E-06***	-2.45E-08	2.94E-06
400	***1.45***	***1.36***	0.89	0.9843	2.26E-06	***1.95E-06***	-3.13E-07	2.76E-06	0.98	0.9844	2.49E-06	***2.45E-06***	-4.14E-08	2.99E-06
500	***1.76***	***1.67***	1.2	0.9846	2.44E-06	***2.13E-06***	-3.11E-07	2.94E-06	1.29	0.9847	2.62E-06	***2.51E-06***	-1.14E-07	3.12E-06
600	***2.09***	***2.00***	1.53	0.9849	2.59E-06	***2.33E-06***	-2.60E-07	3.09E-06	1.62	0.9850	2.75E-06	***2.63E-06***	-1.13E-07	3.25E-06
700	***2.45***	***2.40***	1.93	0.9853	2.80E-06	***2.49E-06***	-3.12E-07	3.30E-06	1.98	0.9854	2.88E-06	***2.74E-06***	-1.41E-07	3.38E-06
800	***2.88***	***2.88***	2.41	0.9858	3.06E-06	***2.74E-06***	-3.26E-07	3.56E-06	2.41	0.9858	3.06E-06	***2.85E-06***	-2.13E-07	3.56E-06

Capsule	OC3	Specimen	28											
		Length	0.9795	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.20***	***1.38***	0	0.9795					0	0.9795				
100	***1.50***	***1.69***	0.31	0.9798	3.16E-06	***3.65E-06***	4.85E-07	3.66E-06	0.3	0.9798	3.06E-06	***3.55E-06***	4.87E-07	3.56E-06
200	***1.97***	***2.02***	0.64	0.9801	3.27E-06	***3.75E-06***	4.83E-07	3.77E-06	0.77	0.9803	3.93E-06	***4.40E-06***	4.69E-07	4.43E-06
300	***2.35***	***2.38***	1	0.9805	3.40E-06	***3.88E-06***	4.80E-07	3.90E-06	1.15	0.9807	3.91E-06	***4.38E-06***	4.69E-07	4.41E-06
400	***2.76***	***2.76***	1.38	0.9809	3.52E-06	***4.00E-06***	4.78E-07	4.02E-06	1.56	0.9811	3.98E-06	***4.45E-06***	4.68E-07	4.48E-06
500	***3.15***	***3.20***	1.82	0.9813	3.72E-06	***4.19E-06***	4.74E-07	4.22E-06	1.95	0.9815	3.98E-06	***4.45E-06***	4.68E-07	4.48E-06
600	***3.60***	***3.67***	2.29	0.9818	3.90E-06	***4.37E-06***	4.69E-07	4.40E-06	2.4	0.9819	4.08E-06	***4.55E-06***	4.66E-07	4.58E-06
700	***4.09***	***4.16***	2.78	0.9823	4.05E-06	***4.52E-06***	4.66E-07	4.55E-06	2.89	0.9824	4.21E-06	***4.68E-06***	4.63E-07	4.71E-06
800	***4.60***	***4.67***	3.29	0.9828	4.20E-06	***4.66E-06***	4.63E-07	4.70E-06	3.4	0.9829	4.34E-06	***4.80E-06***	4.61E-07	4.84E-06

Capsule	OC3	Specimen	29											
		Length	0.9830	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.84***	***0.65***	0	0.9830					0	0.9830				
100	***1.19***	***0.99***	0.34	0.9833	3.46E-06	***3.95E-06***	4.91E-07	3.96E-06	0.35	0.9834	3.56E-06	***4.05E-06***	4.89E-07	4.06E-06
200	***1.53***	***1.34***	0.69	0.9837	3.51E-06	***4.00E-06***	4.90E-07	4.01E-06	0.69	0.9837	3.51E-06	***4.00E-06***	4.90E-07	4.01E-06
300	***1.89***	***1.71***	1.06	0.9841	3.59E-06	***4.08E-06***	4.89E-07	4.09E-06	1.05	0.9841	3.56E-06	***4.05E-06***	4.89E-07	4.06E-06
400	***2.28***	***2.12***	1.47	0.9845	3.74E-06	***4.23E-06***	4.86E-07	4.24E-06	1.44	0.9844	3.66E-06	***4.15E-06***	4.88E-07	4.16E-06
500	***2.68***	***2.60***	1.95	0.9850	3.97E-06	***4.45E-06***	4.83E-07	4.47E-06	1.84	0.9848	3.74E-06	***4.23E-06***	4.86E-07	4.24E-06
600	***3.10***	***3.11***	2.46	0.9855	4.17E-06	***4.65E-06***	4.79E-07	4.67E-06	2.26	0.9853	3.83E-06	***4.32E-06***	4.84E-07	4.33E-06
700	***3.56***	***3.60***	2.95	0.9860	4.29E-06	***4.76E-06***	4.77E-07	4.79E-06	2.72	0.9857	3.95E-06	***4.44E-06***	4.82E-07	4.45E-06
800	***4.10***	***4.18***	3.53	0.9865	4.49E-06	***4.96E-06***	4.73E-07	4.99E-06	3.26	0.9863	4.15E-06	***4.63E-06***	4.80E-07	4.65E-06

Capsule	OC3	Specimen	34											
		Length	0.9830	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.96***	***1.29***	0	0.9830					0	0.9830				
100	***1.27***	***1.59***	0.3	0.9833	3.05E-06	***3.55E-06***	4.98E-07	3.55E-06	0.31	0.9833	3.15E-06	***3.65E-06***	4.96E-07	3.65E-06
200	***1.61***	***1.91***	0.62	0.9836	3.15E-06	***3.65E-06***	4.96E-07	3.65E-06	0.65	0.9837	3.31E-06	***3.80E-06***	4.94E-07	3.81E-06
300	***2.00***	***2.27***	0.98	0.9840	3.32E-06	***3.82E-06***	4.93E-07	3.82E-06	1.04	0.9840	3.53E-06	***4.02E-06***	4.89E-07	4.03E-06
400	***2.39***	***2.70***	1.41	0.9844	3.59E-06	***4.08E-06***	4.89E-07	4.09E-06	1.43	0.9844	3.64E-06	***4.13E-06***	4.88E-07	4.14E-06
500	***2.83***	***3.14***	1.85	0.9849	3.76E-06	***4.25E-06***	4.86E-07	4.26E-06	1.87	0.9849	3.80E-06	***4.29E-06***	4.85E-07	4.30E-06
600	***3.28***	***3.60***	2.31	0.9853	3.92E-06	***4.40E-06***	4.83E-07	4.42E-06	2.32	0.9853	3.93E-06	***4.42E-06***	4.82E-07	4.43E-06
700	***3.81***	***4.03***	2.74	0.9857	3.98E-06	***4.46E-06***	4.82E-07	4.48E-06	2.85	0.9859	4.14E-06	***4.62E-06***	4.79E-07	4.64E-06
800	***4.40***	***4.52***	3.23	0.9862	4.11E-06	***4.59E-06***	4.80E-07	4.61E-06	3.44	0.9864	4.37E-06	***4.85E-06***	4.76E-07	4.87E-06

Capsule	OC3	Specimen	38											
		Length	0.9807	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.90***	***1.19***	0	0.9807					0	0.9807				
100	***1.20***	***1.46***	0.27	0.9810	2.75E-06	***3.25E-06***	4.97E-07	3.25E-06	0.3	0.9810	3.06E-06	***3.55E-06***	4.91E-07	3.56E-06
200	***1.53***	***1.72***	0.53	0.9812	2.70E-06	***3.20E-06***	4.98E-07	3.20E-06	0.63	0.9813	3.21E-06	***3.70E-06***	4.88E-07	3.71E-06
300	***1.86***	***2.00***	0.81	0.9815	2.75E-06	***3.25E-06***	4.97E-07	3.25E-06	0.96	0.9817	3.26E-06	***3.75E-06***	4.87E-07	3.76E-06
400	***2.16***	***2.32***	1.13	0.9818	2.88E-06	***3.38E-06***	4.94E-07	3.38E-06	1.26	0.9820	3.21E-06	***3.70E-06***	4.88E-07	3.71E-06
500	***2.49***	***2.69***	1.5	0.9822	3.06E-06	***3.55E-06***	4.91E-07	3.56E-06	1.59	0.9823	3.24E-06	***3.73E-06***	4.87E-07	3.74E-06
600	***2.93***	***3.04***	1.85	0.9826	3.14E-06	***3.63E-06***	4.89E-07	3.64E-06	2.03	0.9827	3.45E-06	***3.93E-06***	4.83E-07	3.95E-06
700	***3.40***	***3.45***	2.26	0.9830	3.29E-06	***3.78E-06***	4.86E-07	3.79E-06	2.5	0.9832	3.64E-06	***4.12E-06***	4.79E-07	4.14E-06
800	***3.83***	***3.87***	2.68	0.9834	3.42E-06	***3.90E-06***	4.84E-07	3.92E-06	2.93	0.9836	3.73E-06	***4.21E-06***	4.77E-07	4.23E-06

Capsule	OC3	Specimen	39											
		Length	0.977	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.98***	***1.15***	0	0.9770					0	0.9770				
100	***1.28***	***1.47***	0.32	0.9773	3.28E-06	***3.75E-06***	4.75E-07	3.78E-06	0.3	0.9773	3.07E-06	***3.55E-06***	4.79E-07	3.57E-06
200	***1.58***	***1.79***	0.64	0.9776	3.28E-06	***3.75E-06***	4.75E-07	3.78E-06	0.6	0.9776	3.07E-06	***3.55E-06***	4.79E-07	3.57E-06
300	***1.90***	***2.11***	0.96	0.9780	3.28E-06	***3.75E-06***	4.75E-07	3.78E-06	0.92	0.9779	3.14E-06	***3.62E-06***	4.77E-07	3.64E-06
400	***2.23***	***2.45***	1.3	0.9783	3.33E-06	***3.80E-06***	4.73E-07	3.83E-06	1.25	0.9783	3.20E-06	***3.68E-06***	4.76E-07	3.70E-06
500	***2.59***	***2.80***	1.65	0.9787	3.38E-06	***3.85E-06***	4.72E-07	3.88E-06	1.61	0.9786	3.30E-06	***3.77E-06***	4.74E-07	3.80E-06
600	***2.99***	***3.19***	2.04	0.9790	3.48E-06	***3.95E-06***	4.70E-07	3.98E-06	2.01	0.9790	3.43E-06	***3.90E-06***	4.71E-07	3.93E-06
700	***3.40***	***3.59***	2.44	0.9794	3.57E-06	***4.04E-06***	4.67E-07	4.07E-06	2.42	0.9794	3.54E-06	***4.01E-06***	4.68E-07	4.04E-06
800	***3.89***	***4.00***	2.85	0.9799	3.65E-06	***4.11E-06***	4.66E-07	4.15E-06	2.91	0.9799	3.72E-06	***4.19E-06***	4.64E-07	4.22E-06

Capsule	OC3	Specimen Length	46 0.9852	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.77***	***1.17***	0	0.9852					0	0.9852				
100	***0.96***	***1.30***	0.13	0.9853	1.32E-06	***1.85E-06***	5.30E-07	1.82E-06	0.19	0.9854	1.93E-06	***2.45E-06***	5.21E-07	2.43E-06
200	***1.25***	***1.50***	0.33	0.9855	1.67E-06	***2.20E-06***	5.25E-07	2.17E-06	0.48	0.9857	2.44E-06	***2.95E-06***	5.14E-07	2.94E-06
300	***1.59***	***1.91***	0.74	0.9859	2.50E-06	***3.02E-06***	5.12E-07	3.00E-06	0.82	0.9860	2.77E-06	***3.28E-06***	5.09E-07	3.27E-06
400	***1.97***	***2.30***	1.13	0.9863	2.87E-06	***3.38E-06***	5.08E-07	3.37E-06	1.2	0.9864	3.05E-06	***3.55E-06***	5.05E-07	3.55E-06
500	***2.40***	***2.73***	1.56	0.9868	3.17E-06	***3.67E-06***	5.03E-07	3.67E-06	1.63	0.9868	3.31E-06	***3.81E-06***	5.01E-07	3.81E-06
600	***2.86***	***3.18***	2.01	0.9872	3.40E-06	***3.90E-06***	5.00E-07	3.90E-06	2.09	0.9873	3.54E-06	***4.03E-06***	4.97E-07	4.04E-06
700	***3.35***	***3.59***	2.42	0.9876	3.51E-06	***4.01E-06***	4.98E-07	4.01E-06	2.58	0.9878	3.74E-06	***4.24E-06***	4.94E-07	4.24E-06
800	***3.84***	***4.12***	2.95	0.9882	3.74E-06	***4.24E-06***	4.94E-07	4.24E-06	3.07	0.9883	3.90E-06	***4.39E-06***	4.92E-07	4.40E-06

Capsule	OC3	Specimen Length	48 0.989	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.88***	***1.32***	0	0.9890					0	0.9890				
100	***1.16***	***1.59***	0.27	0.9893	2.73E-06	***1.75E-06***	-9.80E-07	3.23E-06	0.28	0.9893	2.83E-06	***2.45E-06***	-3.81E-07	3.33E-06
200	***1.48***	***1.88***	0.56	0.9896	2.83E-06	***1.75E-06***	-1.08E-06	3.33E-06	0.6	0.9896	3.03E-06	***2.35E-06***	-6.83E-07	3.53E-06
300	***1.86***	***2.16***	0.84	0.9898	2.83E-06	***1.82E-06***	-1.02E-06	3.33E-06	0.98	0.9900	3.30E-06	***2.42E-06***	-8.87E-07	3.80E-06
400	***2.13***	***2.48***	1.16	0.9902	2.93E-06	***1.95E-06***	-9.82E-07	3.43E-06	1.25	0.9903	3.16E-06	***2.45E-06***	-7.10E-07	3.66E-06
500	***2.56***	***2.81***	1.49	0.9905	3.01E-06	***2.13E-06***	-8.83E-07	3.51E-06	1.68	0.9907	3.40E-06	***2.51E-06***	-8.87E-07	3.90E-06
600	***3.06***	***3.20***	1.88	0.9909	3.17E-06	***2.33E-06***	-8.35E-07	3.67E-06	2.18	0.9912	3.67E-06	***2.63E-06***	-1.04E-06	4.17E-06
700	***3.53***	***3.63***	2.31	0.9913	3.34E-06	***2.49E-06***	-8.45E-07	3.84E-06	2.65	0.9917	3.83E-06	***2.74E-06***	-1.09E-06	4.33E-06
800	***4.01***	***4.05***	2.73	0.9917	3.45E-06	***2.74E-06***	-7.13E-07	3.95E-06	3.13	0.9921	3.96E-06	***2.85E-06***	-1.11E-06	4.46E-06

Capsule	OC3	Specimen	51											
		Length	0.9733	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.80***	***0.71***	0	0.9733					0	0.9733				
100	***1.12***	***1.07***	0.36	0.9737	3.70E-06	***4.15E-06***	4.51E-07	4.20E-06	0.32	0.9736	3.29E-06	***3.75E-06***	4.62E-07	3.79E-06
200	***1.46***	***1.43***	0.72	0.9740	3.70E-06	***4.15E-06***	4.51E-07	4.20E-06	0.66	0.9740	3.39E-06	***3.85E-06***	4.59E-07	3.89E-06
300	***1.90***	***1.80***	1.09	0.9744	3.73E-06	***4.18E-06***	4.50E-07	4.23E-06	1.1	0.9744	3.77E-06	***4.22E-06***	4.49E-07	4.27E-06
400	***2.26***	***2.20***	1.49	0.9748	3.83E-06	***4.28E-06***	4.48E-07	4.33E-06	1.46	0.9748	3.75E-06	***4.20E-06***	4.50E-07	4.25E-06
500	***12.67***	***2.63***	1.92	0.9752	3.95E-06	***4.39E-06***	4.45E-07	4.45E-06	11.87	0.9852	2.44E-05	***4.29E-06***	-2.01E-05	2.49E-05
600	***3.12***	***3.13***	2.42	0.9757	4.14E-06	***4.58E-06***	4.39E-07	4.64E-06	2.32	0.9756	3.97E-06	***4.42E-06***	4.43E-07	4.47E-06
700	***3.61***	***3.61***	2.9	0.9762	4.26E-06	***4.69E-06***	4.35E-07	4.76E-06	2.81	0.9761	4.12E-06	***4.56E-06***	4.40E-07	4.62E-06
800	***4.11***	***4.16***	3.45	0.9768	4.43E-06	***4.86E-06***	4.31E-07	4.93E-06	3.31	0.9766	4.25E-06	***4.69E-06***	4.36E-07	4.75E-06

Capsule	OC3	Specimen	52											
		Length	0.9607	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.92***	***0.65***	0	0.9607					0	0.9607				
100	***1.23***	***1.01***	0.36	0.9611	3.75E-06	***4.15E-06***	4.03E-07	4.25E-06	0.31	0.9610	3.23E-06	***3.65E-06***	4.23E-07	3.73E-06
200	***1.58***	***1.40***	0.75	0.9615	3.90E-06	***4.30E-06***	3.97E-07	4.40E-06	0.66	0.9614	3.43E-06	***3.85E-06***	4.15E-07	3.93E-06
300	***1.93***	***1.78***	1.13	0.9618	3.92E-06	***4.32E-06***	3.95E-07	4.42E-06	1.01	0.9617	3.50E-06	***3.92E-06***	4.12E-07	4.00E-06
400	***2.30***	***2.16***	1.51	0.9622	3.93E-06	***4.33E-06***	3.96E-07	4.43E-06	1.38	0.9621	3.59E-06	***4.00E-06***	4.09E-07	4.09E-06
500	***2.73***	***2.62***	1.97	0.9627	4.10E-06	***4.49E-06***	3.89E-07	4.60E-06	1.81	0.9625	3.77E-06	***4.17E-06***	4.02E-07	4.27E-06
600	***3.19***	***3.13***	2.48	0.9632	4.30E-06	***4.68E-06***	3.81E-07	4.80E-06	2.27	0.9630	3.94E-06	***4.33E-06***	3.95E-07	4.44E-06
700	***3.69***	***3.65***	3	0.9637	4.46E-06	***4.84E-06***	3.74E-07	4.96E-06	2.77	0.9635	4.12E-06	***4.51E-06***	3.88E-07	4.62E-06
800	***4.23***	***4.23***	3.58	0.9643	4.66E-06	***5.03E-06***	3.67E-07	5.16E-06	3.31	0.9640	4.31E-06	***4.69E-06***	3.80E-07	4.81E-06

Capsule	OC3	Specimen Length	53 0.9761	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.88***	***1.00***	0	0.9761					0	0.9761				
100	***1.17***	***1.29***	0.29	0.9764	2.97E-06	***3.45E-06***	4.79E-07	3.47E-06	0.29	0.9764	2.97E-06	***3.45E-06***	4.79E-07	3.47E-06
200	***1.50***	***1.59***	0.59	0.9767	3.02E-06	***3.50E-06***	4.78E-07	3.52E-06	0.62	0.9767	3.18E-06	***3.65E-06***	4.74E-07	3.68E-06
300	***1.90***	***1.88***	0.88	0.9770	3.01E-06	***3.48E-06***	4.78E-07	3.51E-06	1.02	0.9771	3.48E-06	***3.95E-06***	4.67E-07	3.98E-06
400	***2.28***	***2.23***	1.23	0.9773	3.15E-06	***3.63E-06***	4.75E-07	3.65E-06	1.4	0.9775	3.59E-06	***4.05E-06***	4.64E-07	4.09E-06
500	***2.70***	***2.65***	1.65	0.9778	3.38E-06	***3.85E-06***	4.69E-07	3.88E-06	1.82	0.9779	3.73E-06	***4.19E-06***	4.61E-07	4.23E-06
600	***3.15***	***3.10***	2.1	0.9782	3.59E-06	***4.05E-06***	4.64E-07	4.09E-06	2.27	0.9784	3.88E-06	***4.33E-06***	4.57E-07	4.38E-06
700	***3.60***	***3.54***	2.54	0.9786	3.72E-06	***4.18E-06***	4.61E-07	4.22E-06	2.72	0.9788	3.98E-06	***4.44E-06***	4.54E-07	4.48E-06
800	***4.09***	***4.09***	3.09	0.9792	3.96E-06	***4.41E-06***	4.55E-07	4.46E-06	3.21	0.9793	4.11E-06	***4.56E-06***	4.51E-07	4.61E-06

Capsule	OC3	Specimen Length	54 0.9605	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.83***	***0.92***	0	0.9605					0	0.9605				
100	***1.23***	***1.31***	0.39	0.9609	4.06E-06	***4.45E-06***	3.90E-07	4.56E-06	0.4	0.9609	4.16E-06	***4.55E-06***	3.86E-07	4.66E-06
200	***1.65***	***1.73***	0.81	0.9613	4.22E-06	***4.60E-06***	3.83E-07	4.72E-06	0.82	0.9613	4.27E-06	***4.65E-06***	3.81E-07	4.77E-06
300	***2.08***	***2.15***	1.23	0.9617	4.27E-06	***4.65E-06***	3.81E-07	4.77E-06	1.25	0.9618	4.34E-06	***4.72E-06***	3.78E-07	4.84E-06
400	***2.52***	***2.59***	1.67	0.9622	4.35E-06	***4.73E-06***	3.78E-07	4.85E-06	1.69	0.9622	4.40E-06	***4.78E-06***	3.76E-07	4.90E-06
500	***3.00***	***3.07***	2.15	0.9627	4.48E-06	***4.85E-06***	3.73E-07	4.98E-06	2.17	0.9627	4.52E-06	***4.89E-06***	3.72E-07	5.02E-06
600	***3.50***	***3.58***	2.66	0.9632	4.62E-06	***4.98E-06***	3.67E-07	5.12E-06	2.67	0.9632	4.63E-06	***5.00E-06***	3.67E-07	5.13E-06
700	***4.06***	***4.14***	3.22	0.9637	4.79E-06	***5.15E-06***	3.61E-07	5.29E-06	3.23	0.9637	4.80E-06	***5.16E-06***	3.60E-07	5.30E-06
800	***4.66***	***4.74***	3.82	0.9643	4.97E-06	***5.33E-06***	3.54E-07	5.47E-06	3.83	0.9643	4.98E-06	***5.34E-06***	3.53E-07	5.48E-06

Capsule	OC3	Specimen Length	61 0.9823	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.75***	***0.95***	0	0.9823					0	0.9823				
100	***1.08***	***1.29***	0.34	0.9826	3.46E-06	***3.95E-06***	4.89E-07	3.96E-06	0.33	0.9826	3.36E-06	***3.85E-06***	4.91E-07	3.86E-06
200	***1.47***	***1.63***	0.68	0.9830	3.46E-06	***3.95E-06***	4.89E-07	3.96E-06	0.72	0.9830	3.66E-06	***4.15E-06***	4.85E-07	4.16E-06
300	***1.86***	***2.01***	1.06	0.9834	3.60E-06	***4.08E-06***	4.86E-07	4.10E-06	1.11	0.9834	3.77E-06	***4.25E-06***	4.83E-07	4.27E-06
400	***2.28***	***2.43***	1.48	0.9838	3.77E-06	***4.25E-06***	4.83E-07	4.27E-06	1.53	0.9838	3.89E-06	***4.38E-06***	4.81E-07	4.39E-06
500	***2.79***	***2.90***	1.95	0.9843	3.97E-06	***4.45E-06***	4.80E-07	4.47E-06	2.04	0.9843	4.15E-06	***4.63E-06***	4.76E-07	4.65E-06
600	***3.30***	***3.40***	2.45	0.9848	4.16E-06	***4.63E-06***	4.76E-07	4.66E-06	2.55	0.9849	4.33E-06	***4.80E-06***	4.73E-07	4.83E-06
700	***3.87***	***3.90***	2.95	0.9853	4.29E-06	***4.76E-06***	4.74E-07	4.79E-06	3.12	0.9854	4.54E-06	***5.01E-06***	4.70E-07	5.04E-06
800	***4.46***	***4.50***	3.55	0.9859	4.52E-06	***4.99E-06***	4.70E-07	5.02E-06	3.71	0.9860	4.72E-06	***5.19E-06***	4.66E-07	5.22E-06

Capsule	OC3	Specimen Length	62 0.9810	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.00***	***1.00***	0	0.9810					0	0.9810				
100	***1.30***	***1.30***	0.3	0.9813	3.06E-06	***3.55E-06***	4.92E-07	3.56E-06	0.3	0.9813	3.06E-06	***3.55E-06***	4.92E-07	3.56E-06
200	***1.65***	***1.61***	0.61	0.9816	3.11E-06	***3.60E-06***	4.91E-07	3.61E-06	0.65	0.9817	3.31E-06	***3.80E-06***	4.87E-07	3.81E-06
300	***2.05***	***1.97***	0.97	0.9820	3.30E-06	***3.78E-06***	4.87E-07	3.80E-06	1.05	0.9821	3.57E-06	***4.05E-06***	4.82E-07	4.07E-06
400	***2.38***	***2.31***	1.31	0.9823	3.34E-06	***3.83E-06***	4.87E-07	3.84E-06	1.38	0.9824	3.52E-06	***4.00E-06***	4.83E-07	4.02E-06
500	***2.75***	***2.71***	1.71	0.9827	3.49E-06	***3.97E-06***	4.84E-07	3.99E-06	1.75	0.9828	3.57E-06	***4.05E-06***	4.82E-07	4.07E-06
600	***3.17***	***3.17***	2.17	0.9832	3.69E-06	***4.17E-06***	4.79E-07	4.19E-06	2.17	0.9832	3.69E-06	***4.17E-06***	4.79E-07	4.19E-06
700	***3.60***	***3.63***	2.63	0.9836	3.83E-06	***4.31E-06***	4.77E-07	4.33E-06	2.6	0.9836	3.79E-06	***4.26E-06***	4.78E-07	4.29E-06
800	***4.07***	***4.12***	3.12	0.9841	3.98E-06	***4.45E-06***	4.74E-07	4.48E-06	3.07	0.9841	3.91E-06	***4.39E-06***	4.75E-07	4.41E-06

Capsule	OC3	Specimen Length	66 0.9959	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.92***	***0.45***	0	0.9959					0	0.9959				
100	***1.13***	***0.61***	0.16	0.9961	1.61E-06	***3.55E-06***	1.94E-06	2.11E-06	0.21	0.9961	2.11E-06	***3.65E-06***	1.54E-06	2.61E-06
200	***1.40***	***0.83***	0.38	0.9963	1.91E-06	***3.65E-06***	1.74E-06	2.41E-06	0.48	0.9964	2.41E-06	***3.80E-06***	1.39E-06	2.91E-06
300	***1.94***	***1.20***	0.75	0.9967	2.51E-06	***3.82E-06***	1.31E-06	3.01E-06	1.02	0.9969	3.41E-06	***4.02E-06***	6.02E-07	3.91E-06
400	***2.69***	***1.79***	1.34	0.9972	3.36E-06	***4.08E-06***	7.11E-07	3.86E-06	1.77	0.9977	4.44E-06	***4.13E-06***	-3.18E-07	4.94E-06
500	***3.60***	***2.69***	2.24	0.9981	4.50E-06	***4.25E-06***	-2.48E-07	5.00E-06	2.68	0.9986	5.38E-06	***4.29E-06***	-1.09E-06	5.88E-06
600	***4.63***	***3.71***	3.26	0.9992	5.46E-06	***4.40E-06***	-1.06E-06	5.96E-06	3.71	0.9996	6.21E-06	***4.42E-06***	-1.79E-06	6.71E-06
700	***5.78***	***5.05***	4.6	1.0005	6.60E-06	***4.46E-06***	-2.13E-06	7.10E-06	4.86	1.0008	6.97E-06	***4.62E-06***	-2.35E-06	7.47E-06
800	***7.08***	***7.15***	6.7	1.0026	8.41E-06	***4.59E-06***	-3.82E-06	8.91E-06	6.16	1.0021	7.73E-06	***4.85E-06***	-2.88E-06	8.23E-06

Capsule	OC3	Specimen Length	69 0.9979	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.99***	***1.11***	0	0.9979					0	0.9979				
100	***1.01***	***1.06***	-0.05	0.9979	-5.01E-07	***4.50E-07***	9.51E-07	-1.05E-09	0.02	0.9979	2.00E-07	***5.50E-07***	3.50E-07	7.00E-07
200	***1.10***	***1.05***	-0.06	0.9978	-3.01E-07	***5.00E-07***	8.01E-07	1.99E-07	0.11	0.9980	5.51E-07	***6.50E-07***	9.88E-08	1.05E-06
300	***1.18***	***1.10***	-0.01	0.9979	-3.34E-08	***5.50E-07***	5.83E-07	4.67E-07	0.19	0.9981	6.35E-07	***6.83E-07***	4.83E-08	1.13E-06
400	***1.33***	***1.21***	0.1	0.9980	2.51E-07	***6.00E-07***	3.49E-07	7.51E-07	0.34	0.9982	8.52E-07	***7.25E-07***	-1.27E-07	1.35E-06
500	***1.57***	***1.46***	0.35	0.9983	7.01E-07	***6.90E-07***	-1.15E-08	1.20E-06	0.58	0.9985	1.16E-06	***7.70E-07***	-3.92E-07	1.66E-06
600	***1.90***	***1.76***	0.65	0.9986	1.09E-06	***7.66E-07***	-3.20E-07	1.59E-06	0.91	0.9988	1.52E-06	***8.50E-07***	-6.70E-07	2.02E-06
700	***2.29***	***2.16***	1.05	0.9990	1.50E-06	***8.50E-07***	-6.53E-07	2.00E-06	1.3	0.9992	1.86E-06	***9.21E-07***	-9.40E-07	2.36E-06
800	***2.78***	***2.78***	1.67	0.9996	2.09E-06	***9.75E-07***	-1.12E-06	2.59E-06	1.79	0.9997	2.24E-06	***1.00E-06***	-1.24E-06	2.74E-06

Capsule	OC3	Specimen	71											
		Length	0.9976	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.88***	***1.08***	0	0.9976					0	0.9976				
100	***0.96***	***1.17***	0.09	0.9977	9.02E-07	***3.55E-06***	2.65E-06	1.40E-06	0.08	0.9977	8.02E-07	***3.65E-06***	2.85E-06	1.30E-06
200	***1.17***	***1.33***	0.25	0.9979	1.25E-06	***3.65E-06***	2.40E-06	1.75E-06	0.29	0.9979	1.45E-06	***3.80E-06***	2.35E-06	1.95E-06
300	***1.41***	***1.53***	0.45	0.9981	1.50E-06	***3.82E-06***	2.31E-06	2.00E-06	0.53	0.9981	1.77E-06	***4.02E-06***	2.25E-06	2.27E-06
400	***1.74***	***1.81***	0.73	0.9983	1.83E-06	***4.08E-06***	2.25E-06	2.33E-06	0.86	0.9985	2.16E-06	***4.13E-06***	1.97E-06	2.66E-06
500	***2.08***	***2.12***	1.04	0.9986	2.09E-06	***4.25E-06***	2.16E-06	2.59E-06	1.2	0.9988	2.41E-06	***4.29E-06***	1.88E-06	2.91E-06
600	***2.45***	***2.50***	1.42	0.9990	2.37E-06	***4.40E-06***	2.03E-06	2.87E-06	1.57	0.9992	2.62E-06	***4.42E-06***	1.79E-06	3.12E-06
700	***2.89***	***2.95***	1.87	0.9995	2.68E-06	***4.46E-06***	1.79E-06	3.18E-06	2.01	0.9996	2.88E-06	***4.62E-06***	1.74E-06	3.38E-06
800	***3.32***	***3.49***	2.41	1.0000	3.02E-06	***4.59E-06***	1.57E-06	3.52E-06	2.44	1.0000	3.06E-06	***4.85E-06***	1.79E-06	3.56E-06

Capsule	OC3	Specimen	74	check										
		Length	0.9981	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.40***	***0.64***	0	0.9981					0	0.9981				
100	***0.77***	***0.88***	0.24	0.9983	2.40E-06	***1.75E-06***	-6.55E-07	2.90E-06	0.37	0.9985	3.71E-06	***2.45E-06***	-1.26E-06	4.21E-06
200	***1.12***	***1.12***	0.48	0.9986	2.40E-06	***1.75E-06***	-6.55E-07	2.90E-06	0.72	0.9988	3.61E-06	***2.35E-06***	-1.26E-06	4.11E-06
300	***1.51***	***1.39***	0.75	0.9989	2.50E-06	***1.82E-06***	-6.89E-07	3.00E-06	1.11	0.9992	3.71E-06	***2.42E-06***	-1.29E-06	4.21E-06
400	***1.91***	***1.76***	1.12	0.9992	2.81E-06	***1.95E-06***	-8.55E-07	3.31E-06	1.51	0.9996	3.78E-06	***2.45E-06***	-1.33E-06	4.28E-06
500	***2.36***	***2.22***	1.58	0.9997	3.17E-06	***2.13E-06***	-1.04E-06	3.67E-06	1.96	1.0001	3.93E-06	***2.51E-06***	-1.42E-06	4.43E-06
600	***2.87***	***2.77***	2.13	1.0002	3.56E-06	***2.33E-06***	-1.22E-06	4.06E-06	2.47	1.0006	4.12E-06	***2.63E-06***	-1.49E-06	4.62E-06
700	***3.45***	***3.36***	2.72	1.0008	3.89E-06	***2.49E-06***	-1.40E-06	4.39E-06	3.05	1.0012	4.37E-06	***2.74E-06***	-1.63E-06	4.87E-06
800	***4.08***	***4.14***	3.5	1.0016	4.38E-06	***2.74E-06***	-1.65E-06	4.88E-06	3.68	1.0018	4.61E-06	***2.85E-06***	-1.76E-06	5.11E-06

Capsule	OC3	Specimen Length	76 0.9981	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.00***	***1.07***	0	0.9961					0	0.9961				
100	***1.15***	***1.21***	0.14	0.9962	1.41E-06	***3.55E-06***	2.14E-06	1.91E-06	0.15	0.9963	1.51E-06	***3.65E-06***	2.14E-06	2.01E-06
200	***1.40***	***1.43***	0.36	0.9965	1.81E-06	***3.65E-06***	1.84E-06	2.31E-06	0.4	0.9965	2.01E-06	***3.80E-06***	1.79E-06	2.51E-06
300	***1.72***	***1.69***	0.62	0.9967	2.07E-06	***3.82E-06***	1.74E-06	2.57E-06	0.72	0.9968	2.41E-06	***4.02E-06***	1.61E-06	2.91E-06
400	***2.09***	***2.00***	0.93	0.9970	2.33E-06	***4.08E-06***	1.74E-06	2.83E-06	1.09	0.9972	2.74E-06	***4.13E-06***	1.39E-06	3.24E-06
500	***2.50***	***2.39***	1.32	0.9974	2.65E-06	***4.25E-06***	1.60E-06	3.15E-06	1.5	0.9976	3.01E-06	***4.29E-06***	1.28E-06	3.51E-06
600	***2.96***	***2.82***	1.75	0.9979	2.93E-06	***4.40E-06***	1.47E-06	3.43E-06	1.96	0.9981	3.28E-06	***4.42E-06***	1.14E-06	3.78E-06
700	***3.45***	***3.32***	2.25	0.9984	3.23E-06	***4.46E-06***	1.24E-06	3.73E-06	2.45	0.9986	3.51E-06	***4.62E-06***	1.11E-06	4.01E-06
800	***3.95***	***3.98***	2.91	0.9990	3.65E-06	***4.59E-06***	9.35E-07	4.15E-06	2.95	0.9991	3.70E-06	***4.85E-06***	1.15E-06	4.20E-06

Capsule	OC3	Specimen Length	80 0.9978	check Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.93***	***1.22***	0	0.9978					0	0.9978				
100	***1.39***	***1.62***	0.4	0.9982	4.01E-06	***2.55E-06***	-1.46E-06	4.51E-06	0.46	0.9983	4.61E-06	***2.85E-06***	-1.76E-06	5.11E-06
200	***1.81***	***2.04***	0.82	0.9986	4.11E-06	***2.60E-06***	-1.51E-06	4.61E-06	0.88	0.9987	4.41E-06	***2.75E-06***	-1.66E-06	4.91E-06
300	***2.28***	***2.48***	1.26	0.9991	4.21E-06	***2.65E-06***	-1.56E-06	4.71E-06	1.35	0.9992	4.51E-06	***2.78E-06***	-1.73E-06	5.01E-06
400	***2.78***	***2.95***	1.73	0.9995	4.33E-06	***2.73E-06***	-1.61E-06	4.83E-06	1.85	0.9997	4.64E-06	***2.85E-06***	-1.79E-06	5.14E-06
500	***3.30***	***3.50***	2.28	1.0001	4.57E-06	***2.83E-06***	-1.74E-06	5.07E-06	2.37	1.0002	4.75E-06	***2.91E-06***	-1.84E-06	5.25E-06
600	***3.88***	***4.09***	2.87	1.0007	4.79E-06	***2.95E-06***	-1.84E-06	5.29E-06	2.95	1.0008	4.93E-06	***3.00E-06***	-1.93E-06	5.43E-06
700	***4.50***	***4.72***	3.5	1.0013	5.01E-06	***3.05E-06***	-1.96E-06	5.51E-06	3.57	1.0014	5.11E-06	***3.09E-06***	-2.02E-06	5.61E-06
800	***5.24***	***5.47***	4.25	1.0021	5.32E-06	***3.21E-06***	-2.11E-06	5.82E-06	4.31	1.0021	5.40E-06	***3.24E-06***	-2.16E-06	5.90E-06

Capsule	OC3	Specimen Length	82 0.9956	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.90***	***1.03***	0	0.9956					0	0.9956				
100	***1.06***	***1.18***	0.15	0.9958	1.51E-06	***3.55E-06***	2.04E-06	2.01E-06	0.16	0.9958	1.61E-06	***3.65E-06***	2.04E-06	2.11E-06
200	***1.30***	***1.40***	0.37	0.9960	1.86E-06	***3.65E-06***	1.79E-06	2.36E-06	0.4	0.9960	2.01E-06	***3.80E-06***	1.79E-06	2.51E-06
300	***1.61***	***1.64***	0.61	0.9962	2.04E-06	***3.82E-06***	1.77E-06	2.54E-06	0.71	0.9963	2.38E-06	***4.02E-06***	1.64E-06	2.88E-06
400	***1.99***	***1.99***	0.96	0.9966	2.41E-06	***4.08E-06***	1.66E-06	2.91E-06	1.09	0.9967	2.74E-06	***4.13E-06***	1.39E-06	3.24E-06
500	***2.41***	***2.34***	1.31	0.9969	2.63E-06	***4.25E-06***	1.62E-06	3.13E-06	1.51	0.9971	3.03E-06	***4.29E-06***	1.26E-06	3.53E-06
600	***2.90***	***2.78***	1.75	0.9974	2.93E-06	***4.40E-06***	1.47E-06	3.43E-06	2	0.9976	3.35E-06	***4.42E-06***	1.07E-06	3.85E-06
700	***3.38***	***3.25***	2.22	0.9978	3.19E-06	***4.46E-06***	1.28E-06	3.69E-06	2.48	0.9981	3.56E-06	***4.62E-06***	1.06E-06	4.06E-06
800	***3.86***	***3.85***	2.82	0.9984	3.54E-06	***4.59E-06***	1.05E-06	4.04E-06	2.96	0.9986	3.72E-06	***4.85E-06***	1.13E-06	4.22E-06

Capsule	OC3	Specimen Length	85 0.9703	check Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.96***	***1.07***	0	0.9703					0	0.9703				
100	***1.44***	***1.41***	0.34	0.9706	3.50E-06	***2.25E-06***	-1.25E-06	4.00E-06	0.48	0.9708	4.95E-06	***2.95E-06***	-2.00E-06	5.45E-06
200	***1.90***	***1.83***	0.76	0.9711	3.92E-06	***2.45E-06***	-1.47E-06	4.42E-06	0.94	0.9712	4.84E-06	***2.90E-06***	-1.94E-06	5.34E-06
300	***2.29***	***2.23***	1.16	0.9715	3.99E-06	***2.48E-06***	-1.50E-06	4.49E-06	1.33	0.9716	4.57E-06	***2.78E-06***	-1.79E-06	5.07E-06
400	***2.72***	***2.77***	1.7	0.9720	4.38E-06	***2.68E-06***	-1.71E-06	4.88E-06	1.76	0.9721	4.53E-06	***2.75E-06***	-1.78E-06	5.03E-06
500	***3.22***	***3.32***	2.25	0.9726	4.64E-06	***2.79E-06***	-1.85E-06	5.14E-06	2.26	0.9726	4.66E-06	***2.81E-06***	-1.85E-06	5.16E-06
600	***3.83***	***3.93***	2.86	0.9732	4.91E-06	***2.93E-06***	-1.98E-06	5.41E-06	2.87	0.9732	4.93E-06	***2.95E-06***	-1.98E-06	5.43E-06
700	***4.45***	***4.52***	3.45	0.9738	5.08E-06	***3.01E-06***	-2.07E-06	5.58E-06	3.49	0.9738	5.14E-06	***3.05E-06***	-2.09E-06	5.64E-06
800	***5.13***	***5.20***	4.13	0.9744	5.32E-06	***3.13E-06***	-2.20E-06	5.82E-06	4.17	0.9745	5.37E-06	***3.16E-06***	-2.21E-06	5.87E-06

Capsule	OC3	Specimen Length	87 0.9955	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.94***	***1.02***	0	0.9955					0	0.9955				
100	***1.10***	***1.14***	0.12	0.9956	1.21E-06	***1.71E-06***	5.00E-07	2.75E-06	0.16	0.9957	1.61E-06	***2.11E-06***	5.00E-07	-1.11E-06
200	***1.37***	***1.37***	0.35	0.9959	1.76E-06	***2.26E-06***	5.00E-07	2.70E-06	0.43	0.9959	2.16E-06	***2.66E-06***	5.00E-07	-1.66E-06
300	***1.68***	***1.60***	0.58	0.9961	1.94E-06	***2.44E-06***	5.00E-07	2.75E-06	0.74	0.9962	2.48E-06	***2.98E-06***	5.00E-07	-1.98E-06
400	***2.02***	***1.91***	0.89	0.9964	2.24E-06	***2.74E-06***	5.00E-07	2.93E-06	1.08	0.9966	2.71E-06	***3.21E-06***	5.00E-07	-2.21E-06
500	***2.42***	***2.28***	1.26	0.9968	2.53E-06	***3.03E-06***	5.00E-07	3.21E-06	1.48	0.9970	2.97E-06	***3.47E-06***	5.00E-07	-2.47E-06
600	***2.85***	***2.69***	1.67	0.9972	2.80E-06	***3.30E-06***	5.00E-07	3.43E-06	1.91	0.9974	3.20E-06	***3.70E-06***	5.00E-07	-2.70E-06
700	***3.27***	***3.16***	2.14	0.9976	3.07E-06	***3.57E-06***	5.00E-07	3.66E-06	2.33	0.9978	3.34E-06	***3.84E-06***	5.00E-07	-2.84E-06
800	***3.73***	***3.74***	2.72	0.9982	3.42E-06	***3.92E-06***	5.00E-07	3.95E-06	2.79	0.9983	3.50E-06	***4.00E-06***	5.00E-07	-3.00E-06

Capsule	OC3	Specimen Length	92 0.9965	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.00***	***1.20***	0	0.9965					0	0.9965				
100	***1.22***	***1.41***	0.21	0.9967	2.11E-06	***3.55E-06***	1.44E-06	2.61E-06	0.22	0.9967	2.21E-06	***3.65E-06***	1.44E-06	2.71E-06
200	***1.55***	***1.70***	0.5	0.9970	2.51E-06	***3.65E-06***	1.14E-06	3.01E-06	0.55	0.9971	2.76E-06	***3.80E-06***	1.04E-06	3.26E-06
300	***1.88***	***1.96***	0.76	0.9973	2.54E-06	***3.82E-06***	1.27E-06	3.04E-06	0.88	0.9974	2.94E-06	***4.02E-06***	1.07E-06	3.44E-06
400	***2.31***	***2.31***	1.11	0.9976	2.78E-06	***4.08E-06***	1.29E-06	3.28E-06	1.31	0.9978	3.29E-06	***4.13E-06***	8.38E-07	3.79E-06
500	***2.80***	***2.72***	1.52	0.9980	3.05E-06	***4.25E-06***	1.20E-06	3.55E-06	1.8	0.9983	3.61E-06	***4.29E-06***	6.77E-07	4.11E-06
600	***3.30***	***3.18***	1.98	0.9985	3.31E-06	***4.40E-06***	1.09E-06	3.81E-06	2.3	0.9988	3.85E-06	***4.42E-06***	5.69E-07	4.35E-06
700	***3.81***	***3.70***	2.5	0.9990	3.58E-06	***4.46E-06***	8.80E-07	4.08E-06	2.81	0.9993	4.03E-06	***4.62E-06***	5.93E-07	4.53E-06
800	***4.33***	***4.35***	3.15	0.9997	3.95E-06	***4.59E-06***	6.36E-07	4.45E-06	3.33	0.9998	4.18E-06	***4.85E-06***	6.73E-07	4.68E-06

Capsule	OC3	Specimen Length	95 0.9985	check Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.95***	***1.28***	0	0.9827					0	0.9827				
100	***1.26***	***1.53***	0.25	0.9830	2.54E-06	***3.05E-06***	5.06E-07	3.04E-06	0.31	0.9830	3.15E-06	***3.65E-06***	4.95E-07	3.65E-06
200	***1.55***	***1.78***	0.5	0.9832	2.54E-06	***3.05E-06***	5.06E-07	3.04E-06	0.6	0.9833	3.05E-06	***3.55E-06***	4.97E-07	3.55E-06
300	***1.91***	***2.03***	0.75	0.9835	2.54E-06	***3.05E-06***	5.06E-07	3.04E-06	0.96	0.9837	3.26E-06	***3.75E-06***	4.94E-07	3.76E-06
400	***2.25***	***2.31***	1.03	0.9837	2.62E-06	***3.13E-06***	5.05E-07	3.12E-06	1.3	0.9840	3.31E-06	***3.80E-06***	4.93E-07	3.81E-06
500	***2.60***	***2.69***	1.41	0.9841	2.87E-06	***3.37E-06***	5.00E-07	3.37E-06	1.65	0.9844	3.36E-06	***3.85E-06***	4.92E-07	3.86E-06
600	***2.97***	***3.05***	1.77	0.9845	3.00E-06	***3.50E-06***	4.98E-07	3.50E-06	2.02	0.9847	3.43E-06	***3.92E-06***	4.90E-07	3.93E-06
700	***3.33***	***3.43***	2.15	0.9849	3.13E-06	***3.62E-06***	4.96E-07	3.63E-06	2.38	0.9851	3.46E-06	***3.95E-06***	4.90E-07	3.96E-06
800	***3.73***	***3.83***	2.55	0.9853	3.24E-06	***3.74E-06***	4.93E-07	3.74E-06	2.78	0.9855	3.54E-06	***4.03E-06***	4.89E-07	4.04E-06

Capsule	OC3	Specimen Length	97 0.996	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.94***	***0.41***	0	0.9960					0	0.9960				
100	***1.03***	***0.61***	0.2	0.9962	2.01E-06	***2.55E-06***	5.42E-07	2.51E-06	0.09	0.9961	9.04E-07	***1.45E-06***	5.46E-07	1.40E-06
200	***1.14***	***0.83***	0.42	0.9964	2.11E-06	***2.65E-06***	5.42E-07	2.61E-06	0.2	0.9962	1.00E-06	***1.55E-06***	5.46E-07	1.50E-06
300	***1.27***	***1.08***	0.67	0.9967	2.24E-06	***2.78E-06***	5.41E-07	2.74E-06	0.33	0.9963	1.10E-06	***1.65E-06***	5.46E-07	1.60E-06
400	***1.43***	***1.33***	0.92	0.9969	2.31E-06	***2.85E-06***	5.41E-07	2.81E-06	0.49	0.9965	1.23E-06	***1.78E-06***	5.45E-07	1.73E-06
500	***1.61***	***1.61***	1.2	0.9972	2.41E-06	***2.95E-06***	5.40E-07	2.91E-06	0.67	0.9967	1.35E-06	***1.89E-06***	5.45E-07	1.85E-06
600	***1.84***	***1.91***	1.5	0.9975	2.51E-06	***3.05E-06***	5.40E-07	3.01E-06	0.9	0.9969	1.51E-06	***2.05E-06***	5.44E-07	2.01E-06
700	***2.13***	***2.21***	1.8	0.9978	2.58E-06	***3.12E-06***	5.39E-07	3.08E-06	1.19	0.9972	1.71E-06	***2.25E-06***	5.43E-07	2.21E-06
800	***2.46***	***2.56***	2.15	0.9982	2.70E-06	***3.24E-06***	5.39E-07	3.20E-06	1.52	0.9975	1.91E-06	***2.45E-06***	5.42E-07	2.41E-06

Capsule	OC3	Specimen	102											
		Length	0.995	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.03***	***1.14***	0	0.9950					0	0.9950				
100	***1.22***	***1.32***	0.18	0.9952	1.81E-06	***3.55E-06***	1.74E-06	2.31E-06	0.19	0.9952	1.91E-06	***3.65E-06***	1.74E-06	2.41E-06
200	***1.50***	***1.54***	0.4	0.9954	2.01E-06	***3.65E-06***	1.64E-06	2.51E-06	0.47	0.9955	2.36E-06	***3.80E-06***	1.44E-06	2.86E-06
300	***1.81***	***1.76***	0.62	0.9956	2.08E-06	***3.82E-06***	1.74E-06	2.58E-06	0.78	0.9958	2.61E-06	***4.02E-06***	1.40E-06	3.11E-06
400	***2.20***	***2.10***	0.96	0.9960	2.41E-06	***4.08E-06***	1.66E-06	2.91E-06	1.17	0.9962	2.94E-06	***4.13E-06***	1.19E-06	3.44E-06
500	***2.60***	***2.49***	1.35	0.9964	2.71E-06	***4.25E-06***	1.54E-06	3.21E-06	1.57	0.9966	3.16E-06	***4.29E-06***	1.13E-06	3.66E-06
600	***3.03***	***2.92***	1.78	0.9968	2.98E-06	***4.40E-06***	1.42E-06	3.48E-06	2	0.9970	3.35E-06	***4.42E-06***	1.07E-06	3.85E-06
700	***3.49***	***2.42***	1.28	0.9963	1.84E-06	***4.46E-06***	2.63E-06	2.34E-06	2.46	0.9975	3.53E-06	***4.62E-06***	1.09E-06	4.03E-06
800	***3.98***	***4.01***	2.87	0.9979	3.61E-06	***4.59E-06***	9.81E-07	4.11E-06	2.95	0.9980	3.71E-06	***4.85E-06***	1.14E-06	4.21E-06

Capsule	OC3	Specimen	111											
		Length	0.9972	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.00***	***1.15***	0	0.9972					0	0.9972				
100	***1.30***	***1.50***	0.35	0.9976	3.51E-06	***3.55E-06***	4.02E-08	4.01E-06	0.3	0.9975	3.01E-06	***3.65E-06***	6.42E-07	3.51E-06
200	***1.65***	***1.76***	0.61	0.9978	3.06E-06	***3.65E-06***	5.91E-07	3.56E-06	0.65	0.9979	3.26E-06	***3.80E-06***	5.41E-07	3.76E-06
300	***2.02***	***2.27***	1.12	0.9983	3.74E-06	***3.82E-06***	7.22E-08	4.24E-06	1.02	0.9982	3.41E-06	***4.02E-06***	6.06E-07	3.91E-06
400	***2.45***	***2.72***	1.57	0.9988	3.94E-06	***4.08E-06***	1.39E-07	4.44E-06	1.45	0.9987	3.64E-06	***4.13E-06***	4.90E-07	4.14E-06
500	***3.12***	***3.26***	2.11	0.9993	4.23E-06	***4.25E-06***	1.82E-08	4.73E-06	2.12	0.9993	4.25E-06	***4.29E-06***	3.81E-08	4.75E-06
600	***3.85***	***3.85***	2.7	0.9999	4.51E-06	***4.40E-06***	-1.13E-07	5.01E-06	2.85	1.0001	4.76E-06	***4.42E-06***	-3.47E-07	5.26E-06
700	***4.61***	***4.50***	3.35	1.0006	4.80E-06	***4.46E-06***	-3.35E-07	5.30E-06	3.61	1.0008	5.17E-06	***4.62E-06***	-5.51E-07	5.67E-06
800	***5.39***	***5.29***	4.14	1.0013	5.19E-06	***4.59E-06***	-6.03E-07	5.69E-06	4.39	1.0016	5.50E-06	***4.85E-06***	-6.53E-07	6.00E-06

Capsule	OC3	Specimen Length	115 0.9953	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.94***	***1.00***	0	0.9953					0	0.9953				
100	***1.08***	***1.68***	0.68	0.9960	6.83E-06	***3.55E-06***	-3.28E-06	7.33E-06	0.14	0.9954	1.41E-06	***3.65E-06***	2.24E-06	1.91E-06
200	***1.30***	***1.26***	0.26	0.9956	1.31E-06	***3.65E-06***	2.34E-06	1.81E-06	0.36	0.9957	1.81E-06	***3.80E-06***	1.99E-06	2.31E-06
300	***1.61***	***1.53***	0.53	0.9958	1.78E-06	***3.82E-06***	2.04E-06	2.28E-06	0.67	0.9960	2.24E-06	***4.02E-06***	1.77E-06	2.74E-06
400	***1.94***	***1.87***	0.87	0.9962	2.19E-06	***4.08E-06***	1.89E-06	2.69E-06	1	0.9963	2.51E-06	***4.13E-06***	1.61E-06	3.01E-06
500	***2.35***	***2.24***	1.24	0.9965	2.49E-06	***4.25E-06***	1.76E-06	2.99E-06	1.41	0.9967	2.83E-06	***4.29E-06***	1.46E-06	3.33E-06
600	***2.77***	***2.67***	1.67	0.9970	2.80E-06	***4.40E-06***	1.60E-06	3.30E-06	1.83	0.9971	3.06E-06	***4.42E-06***	1.35E-06	3.56E-06
700	***3.22***	***3.14***	2.14	0.9974	3.07E-06	***4.46E-06***	1.39E-06	3.57E-06	2.28	0.9976	3.27E-06	***4.62E-06***	1.35E-06	3.77E-06
800	***3.69***	***3.75***	2.75	0.9981	3.45E-06	***4.59E-06***	1.13E-06	3.95E-06	2.75	0.9981	3.45E-06	***4.85E-06***	1.40E-06	3.95E-06

Capsule	OC3	Specimen Length	117 0.9966	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.84***	***1.14***	0	0.9966					0	0.9966				
100	***1.02***	***1.32***	0.18	0.9968	1.81E-06	***3.55E-06***	1.74E-06	2.31E-06	0.18	0.9968	1.81E-06	***3.65E-06***	1.84E-06	2.31E-06
200	***1.29***	***1.57***	0.43	0.9970	2.16E-06	***3.65E-06***	1.49E-06	2.66E-06	0.45	0.9971	2.26E-06	***3.80E-06***	1.54E-06	2.76E-06
300	***1.61***	***1.85***	0.71	0.9973	2.37E-06	***3.82E-06***	1.44E-06	2.87E-06	0.77	0.9974	2.58E-06	***4.02E-06***	1.44E-06	3.08E-06
400	***1.98***	***2.16***	1.02	0.9976	2.56E-06	***4.08E-06***	1.52E-06	3.06E-06	1.14	0.9977	2.86E-06	***4.13E-06***	1.27E-06	3.36E-06
500	***2.38***	***2.51***	1.37	0.9980	2.75E-06	***4.25E-06***	1.50E-06	3.25E-06	1.54	0.9981	3.09E-06	***4.29E-06***	1.20E-06	3.59E-06
600	***2.83***	***2.95***	1.81	0.9984	3.03E-06	***4.40E-06***	1.37E-06	3.53E-06	1.99	0.9986	3.33E-06	***4.42E-06***	1.09E-06	3.83E-06
700	***3.30***	***3.40***	2.26	0.9989	3.24E-06	***4.46E-06***	1.22E-06	3.74E-06	2.46	0.9991	3.53E-06	***4.62E-06***	1.09E-06	4.03E-06
800	***3.79***	***3.81***	2.67	0.9993	3.35E-06	***4.59E-06***	1.24E-06	3.85E-06	2.95	0.9996	3.70E-06	***4.85E-06***	1.15E-06	4.20E-06

Capsule	OC3	Specimen	124											
		Length	0.9972	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.97***	***1.03***	0	0.9972					0	0.9972				
100	***1.16***	***1.20***	0.17	0.9974	1.70E-06	***2.25E-06***	5.45E-07	2.20E-06	0.19	0.9974	1.91E-06	***2.45E-06***	5.45E-07	2.41E-06
200	***1.36***	***1.40***	0.37	0.9976	1.86E-06	***2.40E-06***	5.45E-07	2.36E-06	0.39	0.9976	1.96E-06	***2.50E-06***	5.45E-07	2.46E-06
300	***1.56***	***1.64***	0.61	0.9978	2.04E-06	***2.58E-06***	5.44E-07	2.54E-06	0.59	0.9978	1.97E-06	***2.52E-06***	5.44E-07	2.47E-06
400	***1.79***	***1.89***	0.86	0.9981	2.16E-06	***2.70E-06***	5.44E-07	2.66E-06	0.82	0.9980	2.06E-06	***2.60E-06***	5.44E-07	2.56E-06
500	***2.01***	***2.17***	1.14	0.9983	2.29E-06	***2.83E-06***	5.44E-07	2.79E-06	1.04	0.9982	2.09E-06	***2.63E-06***	5.44E-07	2.59E-06
600	***2.30***	***2.50***	1.47	0.9987	2.46E-06	***3.00E-06***	5.43E-07	2.96E-06	1.33	0.9985	2.22E-06	***2.77E-06***	5.43E-07	2.72E-06
700	***2.59***	***2.80***	1.77	0.9990	2.54E-06	***3.08E-06***	5.42E-07	3.04E-06	1.62	0.9988	2.32E-06	***2.86E-06***	5.43E-07	2.82E-06
800	***2.90***	***3.15***	2.12	0.9993	2.66E-06	***3.20E-06***	5.43E-07	3.16E-06	1.93	0.9991	2.42E-06	***2.96E-06***	5.43E-07	2.92E-06

Capsule	OC3	Specimen	125											
		Length	0.998	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.80***	***0.90***	0	0.9980					0	0.9980				
100	***1.00***	***1.10***	0.2	0.9982	2.00E-06	***3.55E-06***	1.55E-06	2.50E-06	0.2	0.9982	2.00E-06	***3.65E-06***	1.65E-06	2.50E-06
200	***1.27***	***1.32***	0.42	0.9984	2.10E-06	***3.65E-06***	1.55E-06	2.60E-06	0.47	0.9985	2.35E-06	***3.80E-06***	1.45E-06	2.85E-06
300	***1.60***	***1.60***	0.7	0.9987	2.34E-06	***3.82E-06***	1.48E-06	2.84E-06	0.8	0.9988	2.67E-06	***4.02E-06***	1.34E-06	3.17E-06
400	***1.95***	***1.90***	1	0.9990	2.51E-06	***4.08E-06***	1.57E-06	3.01E-06	1.15	0.9992	2.88E-06	***4.13E-06***	1.24E-06	3.38E-06
500	***2.40***	***2.28***	1.38	0.9994	2.77E-06	***4.25E-06***	1.48E-06	3.27E-06	1.6	0.9996	3.21E-06	***4.29E-06***	1.08E-06	3.71E-06
600	***2.84***	***2.72***	1.82	0.9998	3.04E-06	***4.40E-06***	1.36E-06	3.54E-06	2.04	1.0000	3.41E-06	***4.42E-06***	1.01E-06	3.91E-06
700	***3.30***	***3.22***	2.32	1.0003	3.32E-06	***4.46E-06***	1.14E-06	3.82E-06	2.5	1.0005	3.58E-06	***4.62E-06***	1.04E-06	4.08E-06
800	***3.76***	***3.81***	2.91	1.0009	3.64E-06	***4.59E-06***	9.42E-07	4.14E-06	2.96	1.0010	3.71E-06	***4.85E-06***	1.14E-06	4.21E-06

Capsule	OC3	Specimen Length	126 0.9976	check Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.43***	***0.50***	0	0.9976					0	0.9976				
100	***0.80***	***0.86***	0.36	0.9980	3.61E-06	***2.35E-06***	-1.26E-06	4.11E-06	0.37	0.9980	3.71E-06	***2.35E-06***	-1.36E-06	4.21E-06
200	***1.19***	***1.25***	0.75	0.9984	3.76E-06	***2.45E-06***	-1.31E-06	4.26E-06	0.76	0.9984	3.81E-06	***2.45E-06***	-1.36E-06	4.31E-06
300	***1.59***	***1.66***	1.16	0.9988	3.88E-06	***2.48E-06***	-1.39E-06	4.38E-06	1.16	0.9988	3.88E-06	***2.48E-06***	-1.39E-06	4.38E-06
400	***2.03***	***2.16***	1.66	0.9993	4.16E-06	***2.63E-06***	-1.53E-06	4.66E-06	1.6	0.9992	4.01E-06	***2.55E-06***	-1.46E-06	4.51E-06
500	***2.56***	***2.72***	2.22	0.9998	4.45E-06	***2.77E-06***	-1.68E-06	4.95E-06	2.13	0.9997	4.27E-06	***2.67E-06***	-1.60E-06	4.77E-06
600	***3.18***	***3.28***	2.78	1.0004	4.64E-06	***2.87E-06***	-1.78E-06	5.14E-06	2.75	1.0004	4.59E-06	***2.83E-06***	-1.76E-06	5.09E-06
700	***3.83***	***3.92***	3.42	1.0010	4.90E-06	***2.99E-06***	-1.91E-06	5.40E-06	3.4	1.0010	4.87E-06	***2.98E-06***	-1.89E-06	5.37E-06
800	***4.55***	***4.65***	4.15	1.0018	5.20E-06	***3.15E-06***	-2.05E-06	5.70E-06	4.12	1.0017	5.16E-06	***3.13E-06***	-2.04E-06	5.66E-06

Capsule	OC3	Specimen Length	171 0.9879	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.90***	***1.00***	0	0.9879					0	0.9879				
100	***1.14***	***1.20***	0.2	0.9881	2.02E-06	***2.55E-06***	5.26E-07	2.52E-06	0.24	0.9881	2.43E-06	***2.95E-06***	5.21E-07	2.93E-06
200	***1.40***	***1.42***	0.42	0.9883	2.13E-06	***2.65E-06***	5.24E-07	2.63E-06	0.5	0.9884	2.53E-06	***3.05E-06***	5.19E-07	3.03E-06
300	***1.72***	***1.69***	0.69	0.9886	2.33E-06	***2.85E-06***	5.22E-07	2.83E-06	0.82	0.9887	2.77E-06	***3.28E-06***	5.16E-07	3.27E-06
400	***2.00***	***1.97***	0.97	0.9889	2.45E-06	***2.98E-06***	5.20E-07	2.95E-06	1.1	0.9890	2.78E-06	***3.30E-06***	5.16E-07	3.28E-06
500	***2.32***	***2.30***	1.3	0.9892	2.63E-06	***3.15E-06***	5.18E-07	3.13E-06	1.42	0.9893	2.87E-06	***3.39E-06***	5.15E-07	3.37E-06
600	***2.70***	***2.70***	1.7	0.9896	2.87E-06	***3.38E-06***	5.15E-07	3.37E-06	1.8	0.9897	3.04E-06	***3.55E-06***	5.13E-07	3.54E-06
700	***3.10***	***3.08***	2.08	0.9900	3.01E-06	***3.52E-06***	5.13E-07	3.51E-06	2.2	0.9901	3.18E-06	***3.69E-06***	5.11E-07	3.68E-06
800	***3.55***	***3.57***	2.57	0.9905	3.25E-06	***3.76E-06***	5.10E-07	3.75E-06	2.65	0.9906	3.35E-06	***3.86E-06***	5.09E-07	3.85E-06

Capsule	OC3	Specimen Length	172 0.9871	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.43***	***1.98***	0	0.9871					0	0.9871				
100	***1.75***	***2.25***	0.27	0.9874	2.74E-06	***3.25E-06***	5.15E-07	3.24E-06	0.32	0.9874	3.24E-06	***3.75E-06***	5.08E-07	3.74E-06
200	***2.10***	***2.60***	0.62	0.9877	3.14E-06	***3.65E-06***	5.09E-07	3.64E-06	0.67	0.9878	3.39E-06	***3.90E-06***	5.06E-07	3.89E-06
300	***2.46***	***2.97***	0.99	0.9881	3.34E-06	***3.85E-06***	5.07E-07	3.84E-06	1.03	0.9881	3.48E-06	***3.98E-06***	5.05E-07	3.98E-06
400	***2.85***	***3.38***	1.4	0.9885	3.55E-06	***4.05E-06***	5.04E-07	4.05E-06	1.42	0.9885	3.60E-06	***4.10E-06***	5.04E-07	4.10E-06
500	***3.28***	***3.80***	1.82	0.9889	3.69E-06	***4.19E-06***	5.02E-07	4.19E-06	1.85	0.9890	3.75E-06	***4.25E-06***	5.02E-07	4.25E-06
600	***3.72***	***4.26***	2.28	0.9894	3.85E-06	***4.35E-06***	5.00E-07	4.35E-06	2.29	0.9894	3.87E-06	***4.37E-06***	4.99E-07	4.37E-06
700	***4.17***	***4.69***	2.71	0.9898	3.92E-06	***4.42E-06***	4.99E-07	4.42E-06	2.74	0.9898	3.97E-06	***4.46E-06***	4.99E-07	4.47E-06
800	***4.60***	***5.12***	3.14	0.9902	3.98E-06	***4.48E-06***	4.99E-07	4.48E-06	3.17	0.9903	4.01E-06	***4.51E-06***	4.98E-07	4.51E-06

Capsule	OC3	Specimen Length	173 0.9858	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.56***	***1.77***	0	0.9858					0	0.9858				
100	***1.79***	***1.95***	0.18	0.9860	1.83E-06	***2.35E-06***	5.24E-07	2.33E-06	0.23	0.9860	2.33E-06	***2.85E-06***	5.17E-07	2.83E-06
200	***2.00***	***2.18***	0.41	0.9862	2.08E-06	***2.60E-06***	5.20E-07	2.58E-06	0.44	0.9862	2.23E-06	***2.75E-06***	5.18E-07	2.73E-06
300	***2.30***	***2.41***	0.64	0.9864	2.16E-06	***2.68E-06***	5.19E-07	2.66E-06	0.74	0.9865	2.50E-06	***3.02E-06***	5.14E-07	3.00E-06
400	***2.58***	***2.66***	0.89	0.9867	2.26E-06	***2.78E-06***	5.18E-07	2.76E-06	1.02	0.9868	2.59E-06	***3.10E-06***	5.13E-07	3.09E-06
500	***2.89***	***2.97***	1.2	0.9870	2.43E-06	***2.95E-06***	5.15E-07	2.93E-06	1.33	0.9871	2.70E-06	***3.21E-06***	5.12E-07	3.20E-06
600	***3.19***	***3.29***	1.52	0.9873	2.57E-06	***3.08E-06***	5.13E-07	3.07E-06	1.63	0.9874	2.76E-06	***3.27E-06***	5.10E-07	3.26E-06
700	***3.57***	***3.62***	1.85	0.9877	2.68E-06	***3.19E-06***	5.11E-07	3.18E-06	2.01	0.9878	2.91E-06	***3.42E-06***	5.08E-07	3.41E-06
800	***3.99***	***3.99***	2.22	0.9880	2.81E-06	***3.33E-06***	5.10E-07	3.31E-06	2.43	0.9882	3.08E-06	***3.59E-06***	5.06E-07	3.58E-06

Capsule	OC3	Specimen	206											
		Length	0.998	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.90***	***1.20***	0	0.9980					0	0.9980				
100	***1.25***	***1.51***	0.31	0.9983	3.11E-06	***3.55E-06***	4.44E-07	3.61E-06	0.35	0.9984	3.51E-06	***3.65E-06***	1.43E-07	4.01E-06
200	***1.75***	***1.99***	0.79	0.9988	3.96E-06	***3.65E-06***	-3.08E-07	4.46E-06	0.85	0.9989	4.26E-06	***3.80E-06***	-4.59E-07	4.76E-06
300	***2.38***	***2.50***	1.3	0.9993	4.34E-06	***3.82E-06***	-5.26E-07	4.84E-06	1.48	0.9995	4.94E-06	***4.02E-06***	-9.27E-07	5.44E-06
400	***3.12***	***3.23***	2.03	1.0000	5.09E-06	***4.08E-06***	-1.01E-06	5.59E-06	2.22	1.0002	5.56E-06	***4.13E-06***	-1.44E-06	6.06E-06
500	***3.97***	***4.02***	2.82	1.0008	5.65E-06	***4.25E-06***	-1.40E-06	6.15E-06	3.07	1.0011	6.15E-06	***4.29E-06***	-1.86E-06	6.65E-06
600	***4.82***	***4.82***	3.62	1.0016	6.05E-06	***4.40E-06***	-1.65E-06	6.55E-06	3.92	1.0019	6.55E-06	***4.42E-06***	-2.13E-06	7.05E-06
700	***5.78***	***5.81***	4.61	1.0026	6.60E-06	***4.46E-06***	-2.13E-06	7.10E-06	4.88	1.0029	6.99E-06	***4.62E-06***	-2.36E-06	7.49E-06
800	***6.80***	***6.89***	5.69	1.0037	7.13E-06	***4.59E-06***	-2.54E-06	7.63E-06	5.9	1.0039	7.39E-06	***4.85E-06***	-2.54E-06	7.89E-06

Capsule	OC3	Specimen	207											
		Length	0.9976	Scale	1"	1.00E-03								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.88***	***1.12***	0	0.9976					0	0.9976				
100	***1.06***	***1.31***	0.19	0.9978	1.90E-06	***3.55E-06***	1.65E-06	2.40E-06	0.18	0.9978	1.80E-06	***3.65E-06***	1.85E-06	2.30E-06
200	***1.30***	***1.53***	0.41	0.9980	2.05E-06	***3.65E-06***	1.60E-06	2.55E-06	0.42	0.9980	2.11E-06	***3.80E-06***	1.69E-06	2.61E-06
300	***1.59***	***1.78***	0.66	0.9983	2.21E-06	***3.82E-06***	1.61E-06	2.71E-06	0.71	0.9983	2.37E-06	***4.02E-06***	1.64E-06	2.87E-06
400	***1.90***	***2.09***	0.97	0.9986	2.43E-06	***4.08E-06***	1.64E-06	2.93E-06	1.02	0.9986	2.56E-06	***4.13E-06***	1.57E-06	3.06E-06
500	***2.45***	***2.45***	1.33	0.9989	2.67E-06	***4.25E-06***	1.58E-06	3.17E-06	1.57	0.9992	3.15E-06	***4.29E-06***	1.14E-06	3.65E-06
600	***2.93***	***2.87***	1.75	0.9994	2.92E-06	***4.40E-06***	1.48E-06	3.42E-06	2.05	0.9997	3.42E-06	***4.42E-06***	9.91E-07	3.92E-06
700	***3.45***	***3.38***	2.26	0.9999	3.24E-06	***4.46E-06***	1.23E-06	3.74E-06	2.57	1.0002	3.68E-06	***4.62E-06***	9.41E-07	4.18E-06
800	***3.99***	***4.02***	2.9	1.0005	3.63E-06	***4.59E-06***	9.53E-07	4.13E-06	3.11	1.0007	3.90E-06	***4.85E-06***	9.53E-07	4.40E-06

OC2 Dilatometer Data

Capsule	OC2	Specimen	15	Material	H-451									
Column	East	Length	0.9902	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.78***	***0.80***	0	0.9902					0	0.9902				
100	***1.41***	***1.52***	0.72	0.9906	3.64E-06			4.14E-06	0.63	0.9905	3.18E-06			3.68E-06
200	***2.21***	***2.28***	1.48	0.9909	3.74E-06			4.24E-06	1.43	0.9909	3.61E-06			4.11E-06
300	***2.98***	***3.12***	2.32	0.9914	3.90E-06			4.40E-06	2.2	0.9913	3.70E-06			4.20E-06
400	***3.75***	***4.10***	3.3	0.9919	4.17E-06			4.67E-06	2.97	0.9917	3.75E-06			4.25E-06
500	***4.80***	***5.00***	4.2	0.9923	4.24E-06	***4.50E-06***	2.42E-07	4.74E-06	4.02	0.9922	4.06E-06	***4.50E-06***	5.98E-08	4.56E-06

Capsule	OC2	Specimen	20	Material	H-451									
Column	East	Length	0.9903	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.10***	***1.45***	0	0.9903					0	0.9903				
100	***1.77***	***2.02***	0.57	0.9906	2.88E-06		-2.88E-06	3.38E-06	0.67	0.9906	3.38E-06		-3.38E-06	3.88E-06
200	***2.50***	***2.70***	1.25	0.9909	3.16E-06		-3.16E-06	3.66E-06	1.4	0.9910	3.53E-06		-3.53E-06	4.03E-06
300	***3.30***	***3.52***	2.07	0.9913	3.48E-06		-3.48E-06	3.98E-06	2.2	0.9914	3.70E-06		-3.70E-06	4.20E-06
400	***4.21***	***4.50***	3.05	0.9918	3.85E-06		-3.85E-06	4.35E-06	3.11	0.9919	3.93E-06		-3.93E-06	4.43E-06
500	***5.22***	***5.39***	3.94	0.9923	3.98E-06	***4.57E-06***	5.91E-07	4.48E-06	4.12	0.9924	4.16E-06	***4.57E-06***	4.10E-07	4.66E-06

Capsule	OC2	Specimen	25	Material	H-451									
Column	East	Length	0.9896	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.90***	***1.27***	0	0.9896					0	0.9896				
100	***1.60***	***1.81***	0.54	0.9899	2.73E-06		-2.73E-06	3.23E-06	0.7	0.9900	3.54E-06		-3.54E-06	4.04E-06
200	***2.35***	***2.50***	1.23	0.9902	3.11E-06		-3.11E-06	3.61E-06	1.45	0.9903	3.66E-06		-3.66E-06	4.16E-06
300	***3.22***	***3.35***	2.08	0.9906	3.50E-06		-3.50E-06	4.00E-06	2.32	0.9908	3.91E-06		-3.91E-06	4.41E-06

400	***4.11***	***4.32***	3.05	0.9911	3.85E-06		-3.85E-06	4.35E-06	3.21	0.9912	4.05E-06		-4.05E-06	4.55E-06
500	***5.12***	***5.22***	3.95	0.9916	3.99E-06	***4.68E-06***	6.88E-07	4.49E-06	4.22	0.9917	4.26E-06	***4.68E-06***	-4.26E-06	4.76E-06

Capsule	OC2	Specimen	27	Material	H-451									
Column	East	Length	0.9898	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.00***	***1.10***	0	0.9898					0	0.9898				
100	***1.52***	***1.67***	0.57	0.9901	2.88E-06		-2.88E-06	3.38E-06	0.52	0.9901	2.63E-06		-2.63E-06	3.13E-06
200	***2.20***	***2.31***	1.21	0.9904	3.06E-06		-3.06E-06	3.56E-06	1.2	0.9904	3.03E-06		-3.03E-06	3.53E-06
300	***3.02***	***3.05***	1.95	0.9908	3.28E-06		-3.28E-06	3.78E-06	2.02	0.9908	3.40E-06		-3.40E-06	3.90E-06
400	***4.00***	***4.10***	3	0.9913	3.79E-06		-3.79E-06	4.29E-06	3	0.9913	3.79E-06		-3.79E-06	4.29E-06
500	***4.72***	***4.90***	3.8	0.9917	3.84E-06	***4.08E-06***	2.41E-07	4.34E-06	3.72	0.9917	3.76E-06	***4.08E-06***	3.22E-07	4.26E-06

Capsule	OC2	Specimen	30	Material	H-451									
Column	East	Length	0.988	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.82***	***0.95***	0	0.9880					0	0.9880				
100	***1.68***	***1.70***	0.75	0.9884	3.80E-06		-3.80E-06	4.30E-06	0.86	0.9884	4.35E-06		-4.35E-06	4.85E-06
200	***2.49***	***2.52***	1.57	0.9888	3.97E-06		-3.97E-06	4.47E-06	1.67	0.9888	4.23E-06		-4.23E-06	4.73E-06
300	***3.40***	***3.58***	2.63	0.9893	4.44E-06		-4.44E-06	4.94E-06	2.58	0.9893	4.35E-06		-4.35E-06	4.85E-06
400	***4.41***	***4.70***	3.75	0.9899	4.74E-06		-4.74E-06	5.24E-06	3.59	0.9898	4.54E-06		-4.54E-06	5.04E-06
500	***5.60***	***5.72***	4.77	0.9904	4.83E-06	***5.24E-06***	4.12E-07	5.33E-06	4.78	0.9904	4.84E-06	***5.24E-06***	4.02E-07	5.34E-06

Capsule	OC2	Specimen	40	Material	H-451									
Column	East	Length	0.9916	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.81***	***1.02***	0	0.9916					0	0.9916				
100	***1.48***	***1.63***	0.61	0.9919	3.08E-06		-3.08E-06	3.58E-06	0.67	0.9919	3.38E-06		-3.38E-06	3.88E-06
200	***2.19***	***2.30***	1.28	0.9922	3.23E-06		-3.23E-06	3.73E-06	1.38	0.9923	3.48E-06		-3.48E-06	3.98E-06
300	***2.95***	***3.19***	2.17	0.9927	3.65E-06		-3.65E-06	4.15E-06	2.14	0.9927	3.60E-06		-3.60E-06	4.10E-06
400	***3.88***	***4.10***	3.08	0.9931	3.88E-06		-3.88E-06	4.38E-06	3.07	0.9931	3.87E-06		-3.87E-06	4.37E-06
500	***4.88***	***4.98***	3.96	0.9936	3.99E-06	***4.50E-06***	5.06E-07	4.49E-06	4.07	0.9936	4.10E-06	***4.50E-06***	3.96E-07	4.60E-06

Capsule	OC2	Specimen	42	Material	H-451									
Column	East	Length	0.9904	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.92***	***1.38***	0	0.9904					0	0.9904				
100	***1.55***	***1.90***	0.52	0.9907	2.63E-06		-2.63E-06	3.13E-06	0.63	0.9907	3.18E-06		-3.18E-06	3.68E-06
200	***2.28***	***2.52***	1.14	0.9910	2.88E-06		-2.88E-06	3.38E-06	1.36	0.9911	3.43E-06		-3.43E-06	3.93E-06
300	***3.12***	***3.39***	2.01	0.9914	3.38E-06		-3.38E-06	3.88E-06	2.2	0.9915	3.70E-06		-3.70E-06	4.20E-06
400	***4.00***	***4.30***	2.92	0.9919	3.69E-06		-3.69E-06	4.19E-06	3.08	0.9919	3.89E-06		-3.89E-06	4.39E-06
500	***5.00***	***5.22***	3.84	0.9923	3.88E-06	***4.56E+00***	4.56E+00	4.38E-06	4.08	0.9924	4.12E-06	***4.56E+00***	4.56E+00	4.62E-06

Capsule	OC2	Specimen	44	Material	H-451									
Column	East	Length	0.9927	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.78***	***0.90***	0	0.9927					0	0.9927				
100	***1.40***	***1.51***	0.61	0.9930	3.07E-06		-3.07E-06	3.57E-06	0.62	0.9930	3.12E-06		-3.12E-06	3.62E-06
200	***2.02***	***2.11***	1.21	0.9933	3.05E-06		-3.05E-06	3.55E-06	1.24	0.9933	3.12E-06		-3.12E-06	3.62E-06
300	***2.80***	***2.98***	2.08	0.9937	3.49E-06		-3.49E-06	3.99E-06	2.02	0.9937	3.39E-06		-3.39E-06	3.89E-06
400	***3.62***	***3.90***	3	0.9942	3.78E-06		-3.78E-06	4.28E-06	2.84	0.9941	3.58E-06		-3.58E-06	4.08E-06
500	***4.60***	***4.78***	3.88	0.9946	3.91E-06	***4.30E-06***	3.91E-07	4.41E-06	3.82	0.9946	3.85E-06	***4.30E-06***	4.52E-07	4.35E-06

Capsule	OC2	Specimen	55	Material	H-451									
Column	East	Length	0.9857	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.70***	***1.40***	0	0.9857					0	0.9857				
100	***1.40***	***2.05***	0.65	0.9860	3.30E-06		-3.30E-06	3.80E-06	0.7	0.9861	3.55E-06		-3.55E-06	4.05E-06
200	***2.20***	***2.72***	1.32	0.9864	3.35E-06		-3.35E-06	3.85E-06	1.5	0.9865	3.80E-06		-3.80E-06	4.30E-06
300	***3.10***	***3.60***	2.2	0.9868	3.72E-06		-3.72E-06	4.22E-06	2.4	0.9869	4.06E-06		-4.06E-06	4.56E-06
400	***4.08***	***4.52***	3.12	0.9873	3.96E-06		-3.96E-06	4.46E-06	3.38	0.9874	4.29E-06		-4.29E-06	4.79E-06
500	***5.10***	***5.46***	4.06	0.9877	4.12E-06	***4.87E-06***	7.51E-07	4.62E-06	4.4	0.9879	4.46E-06	***4.87E-06***	4.06E-07	4.96E-06

Capsule	OC2	Specimen	57	Material	H-451									
Column	East	Length	0.9845	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.80***	***1.10***	0	0.9845					0	0.9845				
100	***1.57***	***1.80***	0.7	0.9849	3.56E-06		-3.56E-06	4.06E-06	0.77	0.9849	3.91E-06		-3.91E-06	4.41E-06
200	***2.32***	***2.50***	1.4	0.9852	3.56E-06		-3.56E-06	4.06E-06	1.52	0.9853	3.86E-06		-3.86E-06	4.36E-06
300	***3.22***	***3.40***	2.3	0.9857	3.89E-06		-3.89E-06	4.39E-06	2.42	0.9857	4.10E-06		-4.10E-06	4.60E-06
400	***4.17***	***4.36***	3.26	0.9861	4.14E-06		-4.14E-06	4.64E-06	3.37	0.9862	4.28E-06		-4.28E-06	4.78E-06
500	***5.20***	***5.39***	4.29	0.9866	4.36E-06	***4.87E-06***	5.12E-07	4.86E-06	4.4	0.9867	4.47E-06	***4.87E-06***	4.01E-07	4.97E-06

Capsule	OC2	Specimen	59	Material	H-451									
Column	East	Length	0.9862	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.60***	***1.12***	0	0.9862					0	0.9862				
100	***1.45***	***1.78***	0.66	0.9865	3.35E-06		-3.35E-06	3.85E-06	0.85	0.9866	4.31E-06		-4.31E-06	4.81E-06
200	***2.20***	***2.48***	1.36	0.9869	3.45E-06		-3.45E-06	3.95E-06	1.6	0.9870	4.06E-06		-4.06E-06	4.56E-06
300	***2.92***	***2.31***	1.19	0.9868	2.01E-06		-2.01E-06	2.51E-06	2.32	0.9874	3.92E-06		-3.92E-06	4.42E-06
400	***3.88***	***4.22***	3.1	0.9878	3.93E-06		-3.93E-06	4.43E-06	3.28	0.9878	4.16E-06		-4.16E-06	4.66E-06
500	***4.95***	***5.21***	4.09	0.9882	4.15E-06	***3.58E-06***	-5.67E-07	4.65E-06	4.35	0.9884	4.41E-06	***3.58E-06***	-8.31E-07	4.91E-06

Capsule	OC2	Specimen	2	Material	H-327									
Column	East	Length	0.9934	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.95***	***1.08***	0	0.9934					0	0.9934				
100	***1.10***	***1.18***	0.1	0.9935	5.03E-07		-5.03E-07	1.00E-06	0.15	0.9935	7.55E-07		-7.55E-07	1.25E-06
200	***1.30***	***1.40***	0.32	0.9936	8.05E-07		-8.05E-07	1.31E-06	0.35	0.9936	8.81E-07		-8.81E-07	1.38E-06
300	***1.60***	***1.70***	0.62	0.9937	1.04E-06		-1.04E-06	1.54E-06	0.65	0.9937	1.09E-06		-1.09E-06	1.59E-06
400	***1.98***	***2.13***	1.05	0.9939	1.32E-06		-1.32E-06	1.82E-06	1.03	0.9939	1.30E-06		-1.30E-06	1.80E-06
500	***2.50***	***2.62***	1.54	0.9942	1.55E-06	***2.00E-06***	4.50E-07	2.05E-06	1.55	0.9942	1.56E-06	***2.00E-06***	4.40E-07	2.06E-06

Capsule	OC2	Specimen	4	Material	H-327									
Column	East	Length	0.9934	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.70***	***0.88***	0	0.9934					0	0.9934				
100	***0.78***	***0.98***	0.1	0.9935	5.03E-07		-5.03E-07	1.00E-06	0.08	0.9934	4.03E-07		-4.03E-07	9.03E-07
200	***0.90***	***1.04***	0.16	0.9935	4.03E-07		-4.03E-07	9.03E-07	0.2	0.9935	5.03E-07		-5.03E-07	1.00E-06
300	***1.20***	***1.34***	0.46	0.9936	7.72E-07		-7.72E-07	1.27E-06	0.5	0.9937	8.39E-07		-8.39E-07	1.34E-06
400	***1.60***	***1.72***	0.84	0.9938	1.06E-06		-1.06E-06	1.56E-06	0.9	0.9939	1.13E-06		-1.13E-06	1.63E-06
500	***2.00***	***2.18***	1.3	0.9941	1.31E-06	***1.85E-06***	5.41E-07	1.81E-06	1.3	0.9941	1.31E-06	***1.85E-06***	5.41E-07	1.81E-06

Capsule	OC2	Specimen	9	Material	H-327									
Column	East	Length	0.9864	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.90***	***1.25***	0	0.9864					0	0.9864				
100	***1.55***	***1.78***	0.53	0.9867	2.69E-06		-2.69E-06	3.19E-06	0.65	0.9867	3.29E-06		-3.29E-06	3.79E-06
200	***2.22***	***2.33***	1.08	0.9869	2.74E-06		-2.74E-06	3.24E-06	1.32	0.9871	3.35E-06		-3.35E-06	3.85E-06
300	***2.93***	***3.20***	1.95	0.9874	3.29E-06		-3.29E-06	3.79E-06	2.03	0.9874	3.43E-06		-3.43E-06	3.93E-06
400	***3.72***	***4.22***	2.97	0.9879	3.76E-06		-3.76E-06	4.26E-06	2.82	0.9878	3.57E-06		-3.57E-06	4.07E-06
500	***4.70***	***5.08***	3.83	0.9883	3.88E-06	***4.28E-06***	3.97E-07	4.38E-06	3.8	0.9883	3.85E-06	***4.28E-06***	4.28E-07	4.35E-06

Capsule	OC2	Specimen	1G	Material	H-327									
Column	East	Length	0.9961	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.10***	***1.12***	0	0.9961					0	0.9961				
100	***1.28***	***2.18***	1.06	0.9966	5.32E-06		-5.32E-06	5.82E-06	1.18	0.9967	5.92E-06		-5.92E-06	6.42E-06
200	***2.48***	***3.22***	2.1	0.9972	5.27E-06		-5.27E-06	5.77E-06	2.38	0.9973	5.97E-06		-5.97E-06	6.47E-06
300	***3.78***	***4.60***	3.48	0.9978	5.82E-06		-5.82E-06	6.32E-06	3.68	0.9979	6.16E-06		-6.16E-06	6.66E-06
400	***5.12***	***5.90***	4.78	0.9985	6.00E-06		-6.00E-06	6.50E-06	5.02	0.9986	6.30E-06		-6.30E-06	6.80E-06
500	***6.55***	***7.10***	5.98	0.9991	6.00E-06	***6.92E-06***	9.17E-07	6.50E-06	6.45	0.9993	6.48E-06	***6.92E-06***	4.45E-07	6.98E-06

Capsule	OC2	Specimen	16	Material	H-451									
Column	West	Length	0.9901	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.01***	***1.50***	0	0.9901					0	0.9901				
100	***1.70***	***2.10***	0.6	0.9904	3.03E-06		-3.03E-06	3.53E-06	0.69	0.9904	3.48E-06		-3.48E-06	3.98E-06
200	***2.40***	***2.72***	1.22	0.9907	3.08E-06		-3.08E-06	3.58E-06	1.39	0.9908	3.51E-06		-3.51E-06	4.01E-06
300	***3.22***	***3.60***	2.1	0.9912	3.53E-06		-3.53E-06	4.03E-06	2.21	0.9912	3.72E-06		-3.72E-06	4.22E-06
400	***4.08***	***4.50***	3	0.9916	3.79E-06		-3.79E-06	4.29E-06	3.07	0.9916	3.88E-06		-3.88E-06	4.38E-06
500	***5.02***	***5.31***	3.81	0.9920	3.85E-06	***4.50E-06***	6.52E-07	4.35E-06	4.01	0.9921	4.05E-06	***4.50E-06***	4.50E-07	4.55E-06

Capsule	OC2	Specimen	21	Material	H-451									
Column	West	Length	0.9905	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.32***	***1.88***	0	0.9905					0	0.9905				
100	***1.92***	***2.38***	0.5	0.9908	2.52E-06		-2.52E-06	3.02E-06	0.6	0.9908	3.03E-06		-3.03E-06	3.53E-06
200	***2.68***	***2.85***	0.97	0.9910	2.45E-06		-2.45E-06	2.95E-06	1.36	0.9912	3.43E-06		-3.43E-06	3.93E-06
300	***3.32***	***3.60***	1.72	0.9914	2.89E-06		-2.89E-06	3.39E-06	2	0.9915	3.37E-06		-3.37E-06	3.87E-06
400	***4.20***	***4.57***	2.69	0.9918	3.39E-06		-3.39E-06	3.89E-06	2.88	0.9919	3.63E-06		-3.63E-06	4.13E-06
500	***5.20***	***5.38***	3.5	0.9923	3.53E-06	***4.50E-06***	9.66E-07	4.03E-06	3.88	0.9924	3.92E-06	***4.50E-06***	5.83E-07	4.42E-06

Capsule	OC2	Specimen	26	Material	H-451									
Column	West	Length	0.9894	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.79***	***0.79***	0	0.9894					0	0.9894				
100	***1.27***	***1.27***	0.48	0.9896	2.43E-06		-2.43E-06	2.93E-06	0.48	0.9896	2.43E-06		-2.43E-06	2.93E-06
200	***1.88***	***1.80***	1.01	0.9899	2.55E-06		-2.55E-06	3.05E-06	1.09	0.9899	2.75E-06		-2.75E-06	3.25E-06
300	***2.42***	***2.55***	1.76	0.9903	2.96E-06		-2.96E-06	3.46E-06	1.63	0.9902	2.75E-06		-2.75E-06	3.25E-06
400	***3.22***	***3.52***	2.73	0.9908	3.45E-06		-3.45E-06	3.95E-06	2.43	0.9906	3.07E-06		-3.07E-06	3.57E-06
500	***4.15***	***4.32***	3.53	0.9912	3.57E-06	***4.50E-06***	9.32E-07	4.07E-06	3.36	0.9911	3.40E-06	***4.50E-06***	1.10E-06	3.90E-06

Capsule	OC2	Specimen	31	Material	H-451									
Column	West	Length	0.9874	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.80***	***1.50***	0	0.9874					0	0.9874				
100	***1.62***	***2.10***	0.6	0.9877	3.04E-06		-3.04E-06	3.54E-06	0.82	0.9878	4.15E-06		-4.15E-06	4.65E-06
200	***2.51***	***2.83***	1.33	0.9881	3.37E-06		-3.37E-06	3.87E-06	1.71	0.9883	4.33E-06		-4.33E-06	4.83E-06
300	***3.50***	***3.80***	2.3	0.9886	3.88E-06		-3.88E-06	4.38E-06	2.7	0.9888	4.56E-06		-4.56E-06	5.06E-06
400	***4.50***	***4.90***	3.4	0.9891	4.30E-06		-4.30E-06	4.80E-06	3.7	0.9893	4.68E-06		-4.68E-06	5.18E-06
500	***5.62***	***6.14***	4.64	0.9897	4.70E-06	***4.50E-06***	-1.99E-07	5.20E-06	4.82	0.9898	4.88E-06	***4.50E-06***	-3.82E-07	5.38E-06

Capsule	OC2	Specimen	41	Material	H-451									
Column	West	Length	0.9916	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.95***	***1.38***	0	0.9916					0	0.9916				
100	***1.43***	***1.85***	0.47	0.9918	2.37E-06		-2.37E-06	2.87E-06	0.48	0.9918	2.42E-06		-2.42E-06	2.92E-06
200	***2.05***	***2.42***	1.04	0.9921	2.62E-06		-2.62E-06	3.12E-06	1.1	0.9922	2.77E-06		-2.77E-06	3.27E-06
300	***2.81***	***3.20***	1.82	0.9925	3.06E-06		-3.06E-06	3.56E-06	1.86	0.9925	3.13E-06		-3.13E-06	3.63E-06
400	***3.68***	***4.08***	2.7	0.9930	3.40E-06		-3.40E-06	3.90E-06	2.73	0.9930	3.44E-06		-3.44E-06	3.94E-06
500	***4.55***	***4.75***	3.37	0.9933	3.40E-06	***4.50E-06***	1.10E-06	3.90E-06	3.6	0.9934	3.63E-06	***4.50E-06***	8.70E-07	4.13E-06

Capsule	OC2	Specimen	43	Material	H-451									
Column	West	Length	0.9901	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.10***	***1.00***	0	0.9901					0	0.9901				
100	***1.25***	***1.62***	0.62	0.9904	3.13E-06		-3.13E-06	3.63E-06	0.15	0.9902	7.57E-07		-7.57E-07	1.26E-06
200	***1.91***	***2.05***	1.05	0.9906	2.65E-06		-2.65E-06	3.15E-06	0.81	0.9905	2.05E-06		-2.05E-06	2.55E-06
300	***2.70***	***2.90***	1.9	0.9911	3.20E-06		-3.20E-06	3.70E-06	1.6	0.9909	2.69E-06		-2.69E-06	3.19E-06
400	***3.55***	***3.82***	2.82	0.9915	3.56E-06		-3.56E-06	4.06E-06	2.45	0.9913	3.09E-06		-3.09E-06	3.59E-06
500	***4.52***	***4.70***	3.7	0.9920	3.74E-06	***4.50E-06***	7.63E-07	4.24E-06	3.42	0.9918	3.45E-06	***4.50E-06***	1.05E-06	3.95E-06

Capsule	OC2	Specimen	45	Material	H-451									
Column	West	Length	0.9931	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.87***	***1.12***	0	0.9931					0	0.9931				
100	***1.50***	***1.70***	0.58	0.9934	2.92E-06		-2.92E-06	3.42E-06	0.63	0.9934	3.17E-06		-3.17E-06	3.67E-06
200	***2.18***	***2.30***	1.18	0.9937	2.97E-06		-2.97E-06	3.47E-06	1.31	0.9938	3.30E-06		-3.30E-06	3.80E-06
300	***2.93***	***3.10***	1.98	0.9941	3.32E-06		-3.32E-06	3.82E-06	2.06	0.9941	3.46E-06		-3.46E-06	3.96E-06
400	***3.78***	***4.02***	2.9	0.9946	3.65E-06		-3.65E-06	4.15E-06	2.91	0.9946	3.66E-06		-3.66E-06	4.16E-06
500	***4.70***	***4.90***	3.78	0.9950	3.81E-06	***4.50E-06***	6.94E-07	4.31E-06	3.83	0.9950	3.86E-06	***4.50E-06***	6.43E-07	4.36E-06

Capsule	OC2	Specimen	47	Material	H-451									
Column	West	Length	0.9887	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.22***	***0.74***	0	0.9887					0	0.9887				
100	***1.00***	***1.45***	0.71	0.9891	3.59E-06		-3.59E-06	4.09E-06	0.78	0.9891	3.94E-06		-3.94E-06	4.44E-06
200	***1.75***	***2.12***	1.38	0.9894	3.49E-06		-3.49E-06	3.99E-06	1.53	0.9895	3.87E-06		-3.87E-06	4.37E-06
300	***2.60***	***3.01***	2.27	0.9898	3.83E-06		-3.83E-06	4.33E-06	2.38	0.9899	4.01E-06		-4.01E-06	4.51E-06
400	***3.48***	***3.90***	3.16	0.9903	4.00E-06		-4.00E-06	4.50E-06	3.26	0.9903	4.12E-06		-4.12E-06	4.62E-06
500	***4.45***	***4.91***	4.17	0.9908	4.22E-06	***4.50E-06***	2.82E-07	4.72E-06	4.23	0.9908	4.28E-06	***4.50E-06***	2.22E-07	4.78E-06

Capsule	OC2	Specimen	56	Material	H-451									
Column	West	Length	0.9776	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.15***	***1.07***	0	0.9776					0	0.9776				
100	***0.90***	***1.74***	0.67	0.9779	3.43E-06		-3.43E-06	3.93E-06	0.75	0.9780	3.84E-06		-3.84E-06	4.34E-06
200	***1.70***	***2.40***	1.33	0.9783	3.40E-06		-3.40E-06	3.90E-06	1.55	0.9784	3.96E-06		-3.96E-06	4.46E-06
300	***2.63***	***3.20***	2.13	0.9787	3.63E-06		-3.63E-06	4.13E-06	2.48	0.9788	4.23E-06		-4.23E-06	4.73E-06
400	***3.60***	***4.10***	3.03	0.9791	3.87E-06		-3.87E-06	4.37E-06	3.45	0.9793	4.41E-06		-4.41E-06	4.91E-06
500	***4.60***	***4.99***	3.92	0.9796	4.01E-06	***4.50E-06***	4.90E-07	4.51E-06	4.45	0.9798	4.55E-06	***4.50E-06***	-5.20E-08	5.05E-06

Capsule	OC2	Specimen	58	Material	H-451									
Column	West	Length	0.985	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.55***	***1.08***	0	0.9850					0	0.9850				
100	***1.25***	***1.72***	0.64	0.9853	3.25E-06		-3.25E-06	3.75E-06	0.7	0.9854	3.55E-06		-3.55E-06	4.05E-06
200	***2.07***	***2.50***	1.42	0.9857	3.60E-06		-3.60E-06	4.10E-06	1.52	0.9858	3.86E-06		-3.86E-06	4.36E-06
300	***2.92***	***3.35***	2.27	0.9861	3.84E-06		-3.84E-06	4.34E-06	2.37	0.9862	4.01E-06		-4.01E-06	4.51E-06
400	***3.85***	***4.30***	3.22	0.9866	4.09E-06		-4.09E-06	4.59E-06	3.3	0.9867	4.19E-06		-4.19E-06	4.69E-06
500	***4.88***	***5.25***	4.17	0.9871	4.23E-06	***4.50E-06***	2.66E-07	4.73E-06	4.33	0.9872	4.40E-06	***4.50E-06***	1.04E-07	4.90E-06

Capsule	OC2	Specimen	60	Material	H-451									
Column	West	Length	0.9853	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***2.78***	***3.22***	0	0.9853					0	0.9853				
100	***3.52***	***3.95***	0.73	0.9857	3.70E-06		-3.70E-06	4.20E-06	0.74	0.9857	3.76E-06		-3.76E-06	4.26E-06
200	***4.32***	***4.75***	1.53	0.9861	3.88E-06		-3.88E-06	4.38E-06	1.54	0.9861	3.91E-06		-3.91E-06	4.41E-06
300	***5.21***	***5.52***	2.3	0.9865	3.89E-06		-3.89E-06	4.39E-06	2.43	0.9865	4.11E-06		-4.11E-06	4.61E-06
400	***6.12***	***6.42***	3.2	0.9869	4.06E-06		-4.06E-06	4.56E-06	3.34	0.9870	4.24E-06		-4.24E-06	4.74E-06
500	***7.18***	***7.42***	4.2	0.9874	4.26E-06	***4.50E-06***	2.37E-07	4.76E-06	4.4	0.9875	4.47E-06	***4.50E-06***	3.44E-08	4.97E-06

Capsule	OC2	Specimen	4	Material	H-327									
Column	West	Length	0.9938	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.90***	***0.90***	0	0.9938					0	0.9938				
100	***0.92***	***1.00***	0.1	0.9939	5.03E-07		-5.03E-07	1.00E-06	0.02	0.9938	1.01E-07		-1.01E-07	6.01E-07
200	***1.18***	***1.20***	0.3	0.9940	7.55E-07		-7.55E-07	1.25E-06	0.28	0.9939	7.04E-07		-7.04E-07	1.20E-06
300	***1.40***	***1.52***	0.62	0.9941	1.04E-06		-1.04E-06	1.54E-06	0.5	0.9941	8.39E-07		-8.39E-07	1.34E-06
400	***1.77***	***1.95***	1.05	0.9943	1.32E-06		-1.32E-06	1.82E-06	0.87	0.9942	1.09E-06		-1.09E-06	1.59E-06
500	***2.20***	***2.30***	1.4	0.9945	1.41E-06	***4.50E-06***	3.09E-06	1.91E-06	1.3	0.9945	1.31E-06	***4.50E-06***	3.19E-06	1.81E-06

Capsule	OC2	Specimen	10	Material	H-327									
Column	West	Length	0.9862	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.91***	***1.17***	0	0.9862					0	0.9862				
100	***1.52***	***1.87***	0.7	0.9866	3.55E-06		-3.55E-06	4.05E-06	0.61	0.9865	3.09E-06		-3.09E-06	3.59E-06
200	***2.22***	***2.40***	1.23	0.9868	3.12E-06		-3.12E-06	3.62E-06	1.31	0.9869	3.32E-06		-3.32E-06	3.82E-06
300	***2.98***	***3.12***	1.95	0.9872	3.30E-06		-3.30E-06	3.80E-06	2.07	0.9872	3.50E-06		-3.50E-06	4.00E-06
400	***3.71***	***4.00***	2.83	0.9876	3.59E-06		-3.59E-06	4.09E-06	2.8	0.9876	3.55E-06		-3.55E-06	4.05E-06
500	***4.69***	***4.90***	3.73	0.9881	3.78E-06	***4.50E-06***	7.18E-07	4.28E-06	3.78	0.9881	3.83E-06	***4.50E-06***	6.67E-07	4.33E-06

Capsule	OC2	Specimen	2G	Material	H-327									
Column	West	Length	0.9956	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.50***	***1.22***	0	0.9956					0	0.9956				
100	***1.52***	***2.20***	0.98	0.9961	4.92E-06		-4.92E-06	5.42E-06	1.02	0.9961	5.12E-06		-5.12E-06	5.62E-06
200	***2.65***	***3.21***	1.99	0.9966	5.00E-06		-5.00E-06	5.50E-06	2.15	0.9967	5.40E-06		-5.40E-06	5.90E-06
300	***3.83***	***4.40***	3.18	0.9972	5.32E-06		-5.32E-06	5.82E-06	3.33	0.9973	5.57E-06		-5.57E-06	6.07E-06
400	***5.10***	***5.60***	4.38	0.9978	5.50E-06		-5.50E-06	6.00E-06	4.6	0.9979	5.78E-06		-5.78E-06	6.28E-06
500	***6.32***	***6.88***	5.66	0.9984	5.69E-06	***4.50E-06***	-1.19E-06	6.19E-06	5.82	0.9985	5.85E-06	***4.50E-06***	-1.35E-06	6.35E-06

Capsule	OC2	Specimen	78	Material	H-451									
Column	North	Length	0.9991	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.75***	***1.85***	0	0.9991					0	0.9991				
100	***1.38***	***2.10***	0.25	0.9992	1.25E-06	***1.75E-06***	4.99E-07	1.75E-06	0.63	0.9994	3.15E-06	***3.65E-06***	4.97E-07	3.65E-06
200	***1.90***	***2.60***	0.75	0.9995	1.88E-06	***2.34E-06***	4.58E-07	2.38E-06	1.15	0.9997	2.88E-06	***3.34E-06***	4.57E-07	3.38E-06
300	***2.61***	***3.10***	1.25	0.9997	2.09E-06	***2.56E-06***	4.78E-07	2.59E-06	1.86	1.0000	3.10E-06	***3.58E-06***	4.77E-07	3.60E-06
400	***3.32***	***3.80***	1.95	1.0001	2.44E-06	***2.91E-06***	4.67E-07	2.94E-06	2.57	1.0004	3.22E-06	***3.68E-06***	4.67E-07	3.72E-06
500	***4.09***	***4.45***	2.6	1.0004	2.60E-06	***3.07E-06***	1.21E-06	3.10E-06	3.34	1.0008	3.34E-06	***3.81E-06***	4.67E-07	3.84E-06

Capsule	OC2	Specimen	83	Material	H-451									
Column	North	Length	0.9992	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.73***	***1.30***	0	0.9992					0	0.9992				
100	***1.27***	***1.76***	0.46	0.9994	2.30E-06	***2.80E-06***	4.98E-07	2.80E-06	0.54	0.9995	2.70E-06	***2.70E+00***	2.70E+00	3.20E-06
200	***1.80***	***2.20***	0.9	0.9997	2.25E-06	***2.71E-06***	4.58E-07	2.75E-06	1.07	0.9997	2.68E-06	***2.94E+00***	2.93E+00	3.18E-06
300	***2.45***	***2.89***	1.59	1.0000	2.65E-06	***3.13E-06***	4.78E-07	3.15E-06	1.72	1.0001	2.87E-06	***3.18E+00***	3.18E+00	3.37E-06
400	***3.20***	***3.63***	2.33	1.0004	2.91E-06	***3.38E-06***	4.67E-07	3.41E-06	2.47	1.0004	3.09E-06	***3.40E+00***	3.39E+00	3.59E-06
500	***4.00***	***4.32***	3.02	1.0007	3.02E-06	***3.49E-06***	6.98E-07	3.52E-06	3.27	1.0008	3.27E-06	***3.61E+00***	3.61E+00	3.77E-06

Capsule	OC2	Specimen	88	Material	H-451									
Column	North	Length	0.9977	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.66***	***1.20***	0	0.9977					0	0.9977				
100	***1.10***	***1.48***	0.28	0.9978	1.40E-06	***1.90E-06***	4.97E-07	1.90E-06	0.44	0.9979	2.21E-06	***2.70E-06***	4.95E-07	2.71E-06
200	***1.65***	***1.90***	0.7	0.9981	1.75E-06	***2.21E-06***	4.56E-07	2.25E-06	0.99	0.9982	2.48E-06	***2.94E-06***	4.54E-07	2.98E-06
300	***2.28***	***2.60***	1.4	0.9984	2.34E-06	***2.81E-06***	4.74E-07	2.84E-06	1.62	0.9985	2.71E-06	***3.18E-06***	4.74E-07	3.21E-06
400	***3.00***	***3.35***	2.15	0.9988	2.69E-06	***3.16E-06***	4.63E-07	3.19E-06	2.34	0.9989	2.93E-06	***3.40E-06***	4.63E-07	3.43E-06
500	***3.80***	***4.10***	2.9	0.9992	2.91E-06	***3.37E-06***	5.73E-07	3.41E-06	3.14	0.9993	3.15E-06	***3.61E-06***	3.33E-07	3.65E-06

Capsule	OC2	Specimen	90	Material	H-451									
Column	North	Length	0.9983	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.40***	***0.98***	0	0.9983					0	0.9983				
100	***1.00***	***1.38***	0.4	0.9985	2.00E-06		-2.00E-06	2.50E-06	0.6	0.9986	3.01E-06		-3.01E-06	3.51E-06
200	***1.45***	***1.81***	0.83	0.9987	2.08E-06		-2.08E-06	2.58E-06	1.05	0.9988	2.63E-06		-2.63E-06	3.13E-06
300	***2.10***	***2.50***	1.52	0.9991	2.54E-06		-2.54E-06	3.04E-06	1.7	0.9992	2.84E-06		-2.84E-06	3.34E-06
400	***2.80***	***3.30***	2.32	0.9995	2.90E-06		-2.90E-06	3.40E-06	2.4	0.9995	3.01E-06		-3.01E-06	3.51E-06
500	***3.60***	***4.03***	3.05	0.9998	3.06E-06	***5.24E-06***	2.18E-06	3.56E-06	3.2	0.9999	3.21E-06	***5.24E-06***	2.03E-06	3.71E-06

Capsule	OC2	Specimen	93	Material	H-451									
Column	North	Length	0.9983	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.92***	***1.35***	0	0.9983					0	0.9983				
100	***1.50***	***2.00***	0.65	0.9986	3.26E-06	***3.00E+00***	3.00E+00	3.76E-06	0.58	0.9986	2.90E-06		-2.90E-06	3.40E-06
200	***2.18***	***2.62***	1.27	0.9989	3.18E-06		-3.18E-06	3.68E-06	1.26	0.9989	3.16E-06		-3.16E-06	3.66E-06
300	***2.98***	***3.43***	2.08	0.9993	3.47E-06		-3.47E-06	3.97E-06	2.06	0.9993	3.44E-06		-3.44E-06	3.94E-06
400	***3.80***	***4.30***	2.95	0.9998	3.69E-06		-3.69E-06	4.19E-06	2.88	0.9997	3.61E-06		-3.61E-06	4.11E-06
500	***4.62***	***5.10***	3.75	1.0002	3.76E-06	***4.08E-06***	3.24E-07	4.26E-06	3.7	1.0002	3.71E-06	***4.08E-06***	3.74E-07	4.21E-06

Capsule	OC2	Specimen	103	Material	H-451									
Column	North	Length	0.9984	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.91***	***1.70***	0	0.9984					0	0.9984				
100	***1.52***	***2.15***	0.45	0.9986	2.25E-06		-2.25E-06	2.75E-06	0.61	0.9987	3.05E-06		-3.05E-06	3.55E-06
200	***2.12***	***2.60***	0.9	0.9989	2.25E-06		-2.25E-06	2.75E-06	1.21	0.9990	3.03E-06		-3.03E-06	3.53E-06
300	***2.80***	***3.32***	1.62	0.9992	2.70E-06		-2.70E-06	3.20E-06	1.89	0.9993	3.16E-06		-3.16E-06	3.66E-06
400	***3.52***	***4.10***	2.4	0.9996	3.00E-06		-3.00E-06	3.50E-06	2.61	0.9997	3.27E-06		-3.27E-06	3.77E-06
500	***4.31***	***4.82***	3.12	1.0000	3.12E-06	***4.50E-06***	1.38E-06	3.62E-06	3.4	1.0001	3.41E-06	***4.50E-06***	1.09E-06	3.91E-06

Capsule	OC2	Specimen	105	Material	H-451									
Column	North	Length	0.9984	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.05***	***1.55***	0	0.9984					0	0.9984				
100	***1.71***	***2.22***	0.67	0.9987	3.36E-06		-3.36E-06	3.86E-06	0.66	0.9987	3.31E-06		-3.31E-06	3.81E-06
200	***2.32***	***2.70***	1.15	0.9990	2.88E-06		-2.88E-06	3.38E-06	1.27	0.9990	3.18E-06		-3.18E-06	3.68E-06
300	***3.03***	***3.40***	1.85	0.9993	3.09E-06		-3.09E-06	3.59E-06	1.98	0.9994	3.31E-06		-3.31E-06	3.81E-06
400	***3.76***	***4.12***	2.57	0.9997	3.22E-06		-3.22E-06	3.72E-06	2.71	0.9998	3.39E-06		-3.39E-06	3.89E-06
500	***4.50***	***4.90***	3.35	1.0001	3.36E-06	***4.56E+00***	4.56E+00	3.86E-06	3.45	1.0001	3.46E-06	***4.56E+00***	4.56E+00	3.96E-06

Capsule	OC2	Specimen	107	Material	H-451									
Column	North	Length	0.9992	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.75***	***1.02***	0	0.9992					0	0.9992				
100	***1.30***	***1.55***	0.53	0.9995	2.65E-06		-2.65E-06	3.15E-06	0.55	0.9995	2.75E-06		-2.75E-06	3.25E-06
200	***1.82***	***2.10***	1.08	0.9997	2.70E-06		-2.70E-06	3.20E-06	1.07	0.9997	2.68E-06		-2.68E-06	3.18E-06
300	***2.50***	***2.75***	1.73	1.0001	2.89E-06		-2.89E-06	3.39E-06	1.75	1.0001	2.92E-06		-2.92E-06	3.42E-06
400	***3.20***	***3.49***	2.47	1.0004	3.09E-06		-3.09E-06	3.59E-06	2.45	1.0004	3.06E-06		-3.06E-06	3.56E-06
500	***3.92***	***4.20***	3.18	1.0008	3.18E-06	***4.30E-06***	1.12E-06	3.68E-06	3.17	1.0008	3.17E-06	***4.30E-06***	1.13E-06	3.67E-06

Capsule	OC2	Specimen	118	Material	H-451									
Column	North	Length	0.9974	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.32***	***0.60***	0	0.9974					0	0.9974				
100	***0.88***	***1.18***	0.58	0.9977	2.91E-06		-2.91E-06	3.41E-06	0.56	0.9977	2.81E-06		-2.81E-06	3.31E-06
200	***1.48***	***1.65***	1.05	0.9979	2.63E-06		-2.63E-06	3.13E-06	1.16	0.9980	2.91E-06		-2.91E-06	3.41E-06
300	***2.18***	***2.38***	1.78	0.9983	2.97E-06		-2.97E-06	3.47E-06	1.86	0.9983	3.11E-06		-3.11E-06	3.61E-06
400	***2.90***	***3.15***	2.55	0.9987	3.20E-06		-3.20E-06	3.70E-06	2.58	0.9987	3.23E-06		-3.23E-06	3.73E-06
500	***3.70***	***4.00***	3.4	0.9991	3.41E-06	***4.87E-06***	1.46E-06	3.91E-06	3.38	0.9991	3.39E-06	***4.87E-06***	1.48E-06	3.89E-06

Capsule	OC2	Specimen	1200	Material	H-451									
Column	North	Length	0.9976	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.80***	***1.10***	0	0.9976					0	0.9976				
100	***1.57***	***1.80***	0.7	0.9980	3.51E-06		-3.51E-06	4.01E-06	0.77	0.9980	3.86E-06		-3.86E-06	4.36E-06
200	***2.32***	***2.50***	1.4	0.9983	3.51E-06		-3.51E-06	4.01E-06	1.52	0.9984	3.81E-06		-3.81E-06	4.31E-06
300	***3.22***	***3.40***	2.3	0.9988	3.84E-06		-3.84E-06	4.34E-06	2.42	0.9988	4.04E-06		-4.04E-06	4.54E-06
400	***4.17***	***4.36***	3.26	0.9992	4.08E-06		-4.08E-06	4.58E-06	3.37	0.9993	4.22E-06		-4.22E-06	4.72E-06
500	***5.20***	***5.39***	4.29	0.9997	4.30E-06	***4.87E-06***	5.70E-07	4.80E-06	4.4	0.9998	4.41E-06	***4.87E-06***	4.59E-07	4.91E-06

Capsule	OC2	Specimen	122	Material	H-451									
Column	North	Length	0.9978	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.60***	***1.10***	0	0.9978					0	0.9978				
100	***1.17***	***1.52***	0.42	0.9980	2.10E-06		-2.10E-06	2.60E-06	0.57	0.9981	2.86E-06		-2.86E-06	3.36E-06
200	***1.70***	***2.10***	1	0.9983	2.51E-06		-2.51E-06	3.01E-06	1.1	0.9984	2.76E-06		-2.76E-06	3.26E-06
300	***2.40***	***2.79***	1.69	0.9986	2.82E-06		-2.82E-06	3.32E-06	1.8	0.9987	3.01E-06		-3.01E-06	3.51E-06
400	***3.20***	***3.59***	2.49	0.9990	3.12E-06		-3.12E-06	3.62E-06	2.6	0.9991	3.26E-06		-3.26E-06	3.76E-06
500	***4.02***	***4.35***	3.25	0.9994	3.26E-06	***3.58E-06***	3.23E-07	3.76E-06	3.42	0.9995	3.43E-06	***3.58E-06***	1.52E-07	3.93E-06

Capsule	OC2	Specimen	65	Material	H-327									
Column	North	Length	0.9989	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.05***	***1.15***	0	0.9989					0	0.9989				
100	***1.10***	***1.21***	0.06	0.9989	3.00E-07		-3.00E-07	8.00E-07	0.05	0.9989	2.50E-07		-2.50E-07	7.50E-07
200	***1.22***	***1.31***	0.16	0.9990	4.00E-07		-4.00E-07	9.00E-07	0.17	0.9990	4.25E-07		-4.25E-07	9.25E-07
300	***1.42***	***1.58***	0.43	0.9991	7.17E-07		-7.17E-07	1.22E-06	0.37	0.9991	6.17E-07		-6.17E-07	1.12E-06
400	***1.70***	***1.92***	0.77	0.9993	9.64E-07		-9.64E-07	1.46E-06	0.65	0.9992	8.13E-07		-8.13E-07	1.31E-06
500	***2.02***	***2.18***	1.03	0.9994	1.03E-06	***2.00E-06***	9.69E-07	1.53E-06	0.97	0.9994	9.71E-07	***2.00E-06***	1.03E-06	1.47E-06

Capsule	OC2	Specimen	72	Material	H-327									
Column	North	Length	0.9994	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.93***	***1.30***	0	0.9994					0	0.9994				
100	***1.43***	***1.72***	0.42	0.9996	2.10E-06		-2.10E-06	2.60E-06	0.5	0.9997	2.50E-06		-2.50E-06	3.00E-06
200	***1.90***	***2.20***	0.9	0.9999	2.25E-06		-2.25E-06	2.75E-06	0.97	0.9999	2.43E-06		-2.43E-06	2.93E-06
300	***2.45***	***2.72***	1.42	1.0001	2.37E-06		-2.37E-06	2.87E-06	1.52	1.0002	2.53E-06		-2.53E-06	3.03E-06
400	***3.10***	***3.38***	2.08	1.0004	2.60E-06		-2.60E-06	3.10E-06	2.17	1.0005	2.71E-06		-2.71E-06	3.21E-06
500	***3.25***	***4.00***	2.7	1.0008	2.70E-06	***1.85E-06***	-8.52E-07	3.20E-06	2.32	1.0006	2.32E-06	***1.85E-06***	-4.71E-07	2.82E-06

Capsule	OC2	Specimen	12	Material	H-327									
Column	North	Length	0.9823	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.75***	***1.18***	0	0.9823					0	0.9823				
100	***1.72***	***2.15***	0.97	0.9828	4.94E-06		-4.94E-06	5.44E-06	0.97	0.9828	4.94E-06		-4.94E-06	5.44E-06
200	***2.82***	***3.20***	2.02	0.9833	5.14E-06		-5.14E-06	5.64E-06	2.07	0.9833	5.27E-06		-5.27E-06	5.77E-06
300	***4.00***	***4.38***	3.2	0.9839	5.43E-06		-5.43E-06	5.93E-06	3.25	0.9839	5.51E-06		-5.51E-06	6.01E-06
400	***5.22***	***5.58***	4.4	0.9845	5.60E-06		-5.60E-06	6.10E-06	4.47	0.9845	5.69E-06		-5.69E-06	6.19E-06
500	***6.49***	***6.70***	5.52	0.9851	5.62E-06	***4.28E-06***	-1.34E-06	6.12E-06	5.74	0.9852	5.84E-06	***4.28E-06***	-1.56E-06	6.34E-06

Capsule	OC2	Specimen	13	Material	H-327									
Column	North	Length	0.9843	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.13***	***0.58***	0	0.9843					0	0.9843				
100	***1.10***	***1.60***	1.02	0.9848	5.18E-06		-5.18E-06	5.68E-06	0.97	0.9848	4.93E-06		-4.93E-06	5.43E-06
200	***2.18***	***2.58***	2	0.9853	5.08E-06		-5.08E-06	5.58E-06	2.05	0.9853	5.21E-06		-5.21E-06	5.71E-06
300	***3.35***	***3.70***	3.12	0.9859	5.28E-06		-5.28E-06	5.78E-06	3.22	0.9859	5.45E-06		-5.45E-06	5.95E-06
400	***4.55***	***4.88***	4.3	0.9865	5.46E-06		-5.46E-06	5.96E-06	4.42	0.9865	5.61E-06		-5.61E-06	6.11E-06
500	***5.78***	***6.00***	5.42	0.9870	5.51E-06	***6.92E-06***	1.41E-06	6.01E-06	5.65	0.9871	5.74E-06	***6.92E-06***	1.18E-06	6.24E-06

Capsule	OC2	Specimen	17	Material	POCO									
Column	North	Length	0.9994	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.18***	***0.50***	0	0.9836					0	0.9836				
100	***1.10***	***1.40***	0.9	0.9841	4.58E-06		-4.58E-06	5.08E-06	0.92	0.9841	4.68E-06		-4.68E-06	5.18E-06
200	***2.08***	***2.32***	1.82	0.9845	4.63E-06		-4.63E-06	5.13E-06	1.9	0.9846	4.83E-06		-4.83E-06	5.33E-06
300	***3.15***	***3.42***	2.92	0.9851	4.95E-06		-4.95E-06	5.45E-06	2.97	0.9851	5.03E-06		-5.03E-06	5.53E-06
400	***4.25***	***4.50***	4	0.9856	5.08E-06		-5.08E-06	5.58E-06	4.07	0.9856	5.17E-06		-5.17E-06	5.67E-06
500	***5.42***	***5.60***	5.1	0.9862	5.19E-06	***6.92E-06***	1.73E-06	5.69E-06	5.24	0.9862	5.33E-06	***6.92E-06***	1.59E-06	5.83E-06

Capsule	OC2	Specimen	67	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.10***	***0.35***	0	0.1000					0	0.1000				
100	***1.01***	***1.30***	0.95	0.1005	4.75E-05		-4.75E-05	4.80E-05	0.91	0.1005	4.55E-05		-4.55E-05	4.60E-05
200	***1.98***	***2.22***	1.87	0.1009	4.67E-05		-4.67E-05	4.72E-05	1.88	0.1009	4.70E-05		-4.70E-05	4.75E-05
300	***3.05***	***3.20***	2.85	0.1014	4.75E-05		-4.75E-05	4.80E-05	2.95	0.1015	4.92E-05		-4.92E-05	4.97E-05
400	***4.02***	***4.22***	3.87	0.1019	4.84E-05		-4.84E-05	4.89E-05	3.92	0.1020	4.90E-05		-4.90E-05	4.95E-05
500	***5.12***	***5.30***	4.95	0.1025	4.95E-05	***4.87E-06***	-4.46E-05	5.00E-05	5.02	0.1025	5.02E-05	***4.87E-06***	-4.53E-05	5.07E-05

Capsule	OC2	Specimen	73	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.49***	***0.97***	0	0.1000					0	0.1000				
100	***0.75***	***1.22***	0.25	0.1001	1.25E-05		-1.25E-05	1.30E-05	0.26	0.1001	1.30E-05		-1.30E-05	1.35E-05
200	***1.05***	***1.70***	0.73	0.1004	1.82E-05		-1.82E-05	1.87E-05	0.56	0.1003	1.40E-05		-1.40E-05	1.45E-05
300	***1.58***	***2.02***	1.05	0.1005	1.75E-05		-1.75E-05	1.80E-05	1.09	0.1005	1.82E-05		-1.82E-05	1.87E-05
400	***2.12***	***2.60***	1.63	0.1008	2.04E-05		-2.04E-05	2.09E-05	1.63	0.1008	2.04E-05		-2.04E-05	2.09E-05
500	***2.78***	***3.20***	2.23	0.1011	2.23E-05	***4.87E-06***	-1.74E-05	2.28E-05	2.29	0.1011	2.29E-05	***4.87E-06***	-1.80E-05	2.34E-05

Capsule	OC2	Specimen	79	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.00***	***1.55***	0	0.1000					0	0.1000				
100	***1.50***	***2.00***	0.45	0.1002	2.25E-05		-2.25E-05	2.30E-05	0.5	0.1003	2.50E-05		-2.50E-05	2.55E-05
200	***2.02***	***2.52***	0.97	0.1005	2.43E-05		-2.43E-05	2.48E-05	1.02	0.1005	2.55E-05		-2.55E-05	2.60E-05
300	***2.68***	***3.20***	1.65	0.1008	2.75E-05		-2.75E-05	2.80E-05	1.68	0.1008	2.80E-05		-2.80E-05	2.85E-05
400	***3.40***	***3.95***	2.4	0.1012	3.00E-05		-3.00E-05	3.05E-05	2.4	0.1012	3.00E-05		-3.00E-05	3.05E-05
500	***4.20***	***4.65***	3.1	0.1016	3.10E-05	***4.87E-06***	-2.61E-05	3.15E-05	3.2	0.1016	3.20E-05	***4.87E-06***	-2.71E-05	3.25E-05

Capsule	OC2	Specimen	84	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.10***	***0.35***	0	0.1000					0	0.1000				
100	***1.01***	***1.30***	0.95	0.1005	4.75E-05		-4.75E-05	4.80E-05	0.91	0.1005	4.55E-05		-4.55E-05	4.60E-05
200	***1.98***	***2.22***	1.87	0.1009	4.67E-05		-4.67E-05	4.72E-05	1.88	0.1009	4.70E-05		-4.70E-05	4.75E-05
300	***3.05***	***3.20***	2.85	0.1014	4.75E-05		-4.75E-05	4.80E-05	2.95	0.1015	4.92E-05		-4.92E-05	4.97E-05
400	***4.02***	***4.22***	3.87	0.1019	4.84E-05		-4.84E-05	4.89E-05	3.92	0.1020	4.90E-05		-4.90E-05	4.95E-05
500	***5.12***	***5.30***	4.95	0.1025	4.95E-05	***4.87E-06***	-4.46E-05	5.00E-05	5.02	0.1025	5.02E-05	***4.87E-06***	-4.53E-05	5.07E-05

Capsule	OC2	Specimen	73	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.49***	***0.97***	0	0.1000					0	0.1000				
100	***0.75***	***1.22***	0.25	0.1001	1.25E-05		-1.25E-05	1.30E-05	0.26	0.1001	1.30E-05		-1.30E-05	1.35E-05
200	***1.05***	***1.70***	0.73	0.1004	1.82E-05		-1.82E-05	1.87E-05	0.56	0.1003	1.40E-05		-1.40E-05	1.45E-05
300	***1.58***	***2.02***	1.05	0.1005	1.75E-05		-1.75E-05	1.80E-05	1.09	0.1005	1.82E-05		-1.82E-05	1.87E-05
400	***2.12***	***2.60***	1.63	0.1008	2.04E-05		-2.04E-05	2.09E-05	1.63	0.1008	2.04E-05		-2.04E-05	2.09E-05
500	***2.78***	***3.20***	2.23	0.1011	2.23E-05	***4.87E-06***	-1.74E-05	2.28E-05	2.29	0.1011	2.29E-05	***4.87E-06***	-1.80E-05	2.34E-05

Capsule	OC2	Specimen	79	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.00***	***1.55***	0	0.1000					0	0.1000				
100	***1.50***	***2.00***	0.45	0.1002	2.25E-05		-2.25E-05	2.30E-05	0.5	0.1003	2.50E-05		-2.50E-05	2.55E-05
200	***2.02***	***2.52***	0.97	0.1005	2.43E-05		-2.43E-05	2.48E-05	1.02	0.1005	2.55E-05		-2.55E-05	2.60E-05
300	***2.68***	***3.20***	1.65	0.1008	2.75E-05		-2.75E-05	2.80E-05	1.68	0.1008	2.80E-05		-2.80E-05	2.85E-05
400	***3.40***	***3.95***	2.4	0.1012	3.00E-05		-3.00E-05	3.05E-05	2.4	0.1012	3.00E-05		-3.00E-05	3.05E-05
500	***4.20***	***4.65***	3.1	0.1016	3.10E-05	***4.87E-06***	-2.61E-05	3.15E-05	3.2	0.1016	3.20E-05	***4.87E-06***	-2.71E-05	3.25E-05

Capsule	OC2	Specimen	67	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.10***	***0.35***	0	0.1000					0	0.1000				
100	***1.01***	***1.30***	0.95	0.1005	4.75E-05		-4.75E-05	4.80E-05	0.91	0.1005	4.55E-05		-4.55E-05	4.60E-05
200	***1.98***	***2.22***	1.87	0.1009	4.67E-05		-4.67E-05	4.72E-05	1.88	0.1009	4.70E-05		-4.70E-05	4.75E-05
300	***3.05***	***3.20***	2.85	0.1014	4.75E-05		-4.75E-05	4.80E-05	2.95	0.1015	4.92E-05		-4.92E-05	4.97E-05
400	***4.02***	***4.22***	3.87	0.1019	4.84E-05		-4.84E-05	4.89E-05	3.92	0.1020	4.90E-05		-4.90E-05	4.95E-05
500	***5.12***	***5.30***	4.95	0.1025	4.95E-05	***4.87E-06***	-4.46E-05	5.00E-05	5.02	0.1025	5.02E-05	***4.87E-06***	-4.53E-05	5.07E-05

Capsule	OC2	Specimen	73	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.49***	***0.97***	0	0.1000					0	0.1000				
100	***0.75***	***1.22***	0.25	0.1001	1.25E-05		-1.25E-05	1.30E-05	0.26	0.1001	1.30E-05		-1.30E-05	1.35E-05
200	***1.05***	***1.70***	0.73	0.1004	1.82E-05		-1.82E-05	1.87E-05	0.56	0.1003	1.40E-05		-1.40E-05	1.45E-05
300	***1.58***	***2.02***	1.05	0.1005	1.75E-05		-1.75E-05	1.80E-05	1.09	0.1005	1.82E-05		-1.82E-05	1.87E-05
400	***2.12***	***2.60***	1.63	0.1008	2.04E-05		-2.04E-05	2.09E-05	1.63	0.1008	2.04E-05		-2.04E-05	2.09E-05
500	***2.78***	***3.20***	2.23	0.1011	2.23E-05	***4.87E-06***	-1.74E-05	2.28E-05	2.29	0.1011	2.29E-05	***4.87E-06***	-1.80E-05	2.34E-05

Capsule	OC2	Specimen	79	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.00***	***1.55***	0	0.1000					0	0.1000				
100	***1.50***	***2.00***	0.45	0.1002	2.25E-05		-2.25E-05	2.30E-05	0.5	0.1003	2.50E-05		-2.50E-05	2.55E-05
200	***2.02***	***2.52***	0.97	0.1005	2.43E-05		-2.43E-05	2.48E-05	1.02	0.1005	2.55E-05		-2.55E-05	2.60E-05
300	***2.68***	***3.20***	1.65	0.1008	2.75E-05		-2.75E-05	2.80E-05	1.68	0.1008	2.80E-05		-2.80E-05	2.85E-05
400	***3.40***	***3.95***	2.4	0.1012	3.00E-05		-3.00E-05	3.05E-05	2.4	0.1012	3.00E-05		-3.00E-05	3.05E-05
500	***4.20***	***4.65***	3.1	0.1016	3.10E-05	***4.87E-06***	-2.61E-05	3.15E-05	3.2	0.1016	3.20E-05	***4.87E-06***	-2.71E-05	3.25E-05

Capsule	OC2	Specimen	67	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.10***	***0.35***	0	0.1000					0	0.1000				
100	***1.01***	***1.30***	0.95	0.1005	4.75E-05		-4.75E-05	4.80E-05	0.91	0.1005	4.55E-05		-4.55E-05	4.60E-05
200	***1.98***	***2.22***	1.87	0.1009	4.67E-05		-4.67E-05	4.72E-05	1.88	0.1009	4.70E-05		-4.70E-05	4.75E-05
300	***3.05***	***3.20***	2.85	0.1014	4.75E-05		-4.75E-05	4.80E-05	2.95	0.1015	4.92E-05		-4.92E-05	4.97E-05
400	***4.02***	***4.22***	3.87	0.1019	4.84E-05		-4.84E-05	4.89E-05	3.92	0.1020	4.90E-05		-4.90E-05	4.95E-05
500	***5.12***	***5.30***	4.95	0.1025	4.95E-05	***4.87E-06***	-4.46E-05	5.00E-05	5.02	0.1025	5.02E-05	***4.87E-06***	-4.53E-05	5.07E-05

Capsule	OC2	Specimen	73	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.49***	***0.97***	0	0.1000					0	0.1000				
100	***0.75***	***1.22***	0.25	0.1001	1.25E-05		-1.25E-05	1.30E-05	0.26	0.1001	1.30E-05		-1.30E-05	1.35E-05
200	***1.05***	***1.70***	0.73	0.1004	1.82E-05		-1.82E-05	1.87E-05	0.56	0.1003	1.40E-05		-1.40E-05	1.45E-05
300	***1.58***	***2.02***	1.05	0.1005	1.75E-05		-1.75E-05	1.80E-05	1.09	0.1005	1.82E-05		-1.82E-05	1.87E-05
400	***2.12***	***2.60***	1.63	0.1008	2.04E-05		-2.04E-05	2.09E-05	1.63	0.1008	2.04E-05		-2.04E-05	2.09E-05
500	***2.78***	***3.20***	2.23	0.1011	2.23E-05	***4.87E-06***	-1.74E-05	2.28E-05	2.29	0.1011	2.29E-05	***4.87E-06***	-1.80E-05	2.34E-05

Capsule	OC2	Specimen	79	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.00***	***1.55***	0	0.1000					0	0.1000				
100	***1.50***	***2.00***	0.45	0.1002	2.25E-05		-2.25E-05	2.30E-05	0.5	0.1003	2.50E-05		-2.50E-05	2.55E-05
200	***2.02***	***2.52***	0.97	0.1005	2.43E-05		-2.43E-05	2.48E-05	1.02	0.1005	2.55E-05		-2.55E-05	2.60E-05
300	***2.68***	***3.20***	1.65	0.1008	2.75E-05		-2.75E-05	2.80E-05	1.68	0.1008	2.80E-05		-2.80E-05	2.85E-05
400	***3.40***	***3.95***	2.4	0.1012	3.00E-05		-3.00E-05	3.05E-05	2.4	0.1012	3.00E-05		-3.00E-05	3.05E-05
500	***4.20***	***4.65***	3.1	0.1016	3.10E-05	***4.87E-06***	-2.61E-05	3.15E-05	3.2	0.1016	3.20E-05	***4.87E-06***	-2.71E-05	3.25E-05

Capsule	OC2	Specimen	67	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.10***	***0.35***	0	0.1000					0	0.1000				
100	***1.01***	***1.30***	0.95	0.1005	4.75E-05		-4.75E-05	4.80E-05	0.91	0.1005	4.55E-05		-4.55E-05	4.60E-05
200	***1.98***	***2.22***	1.87	0.1009	4.67E-05		-4.67E-05	4.72E-05	1.88	0.1009	4.70E-05		-4.70E-05	4.75E-05
300	***3.05***	***3.20***	2.85	0.1014	4.75E-05		-4.75E-05	4.80E-05	2.95	0.1015	4.92E-05		-4.92E-05	4.97E-05
400	***4.02***	***4.22***	3.87	0.1019	4.84E-05		-4.84E-05	4.89E-05	3.92	0.1020	4.90E-05		-4.90E-05	4.95E-05
500	***5.12***	***5.30***	4.95	0.1025	4.95E-05	***4.87E-06***	-4.46E-05	5.00E-05	5.02	0.1025	5.02E-05	***4.87E-06***	-4.53E-05	5.07E-05

Capsule	OC2	Specimen	73	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.49***	***0.97***	0	0.1000					0	0.1000				
100	***0.75***	***1.22***	0.25	0.1001	1.25E-05		-1.25E-05	1.30E-05	0.26	0.1001	1.30E-05		-1.30E-05	1.35E-05
200	***1.05***	***1.70***	0.73	0.1004	1.82E-05		-1.82E-05	1.87E-05	0.56	0.1003	1.40E-05		-1.40E-05	1.45E-05
300	***1.58***	***2.02***	1.05	0.1005	1.75E-05		-1.75E-05	1.80E-05	1.09	0.1005	1.82E-05		-1.82E-05	1.87E-05
400	***2.12***	***2.60***	1.63	0.1008	2.04E-05		-2.04E-05	2.09E-05	1.63	0.1008	2.04E-05		-2.04E-05	2.09E-05
500	***2.78***	***3.20***	2.23	0.1011	2.23E-05	***4.87E-06***	-1.74E-05	2.28E-05	2.29	0.1011	2.29E-05	***4.87E-06***	-1.80E-05	2.34E-05

Capsule	OC2	Specimen	79	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.00***	***1.55***	0	0.1000					0	0.1000				
100	***1.50***	***2.00***	0.45	0.1002	2.25E-05		-2.25E-05	2.30E-05	0.5	0.1003	2.50E-05		-2.50E-05	2.55E-05
200	***2.02***	***2.52***	0.97	0.1005	2.43E-05		-2.43E-05	2.48E-05	1.02	0.1005	2.55E-05		-2.55E-05	2.60E-05
300	***2.68***	***3.20***	1.65	0.1008	2.75E-05		-2.75E-05	2.80E-05	1.68	0.1008	2.80E-05		-2.80E-05	2.85E-05
400	***3.40***	***3.95***	2.4	0.1012	3.00E-05		-3.00E-05	3.05E-05	2.4	0.1012	3.00E-05		-3.00E-05	3.05E-05
500	***4.20***	***4.65***	3.1	0.1016	3.10E-05	***4.87E-06***	-2.61E-05	3.15E-05	3.2	0.1016	3.20E-05	***4.87E-06***	-2.71E-05	3.25E-05

Capsule	OC2	Specimen	67	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.10***	***0.35***	0	0.1000					0	0.1000				
100	***1.01***	***1.30***	0.95	0.1005	4.75E-05		-4.75E-05	4.80E-05	0.91	0.1005	4.55E-05		-4.55E-05	4.60E-05
200	***1.98***	***2.22***	1.87	0.1009	4.67E-05		-4.67E-05	4.72E-05	1.88	0.1009	4.70E-05		-4.70E-05	4.75E-05
300	***3.05***	***3.20***	2.85	0.1014	4.75E-05		-4.75E-05	4.80E-05	2.95	0.1015	4.92E-05		-4.92E-05	4.97E-05
400	***4.02***	***4.22***	3.87	0.1019	4.84E-05		-4.84E-05	4.89E-05	3.92	0.1020	4.90E-05		-4.90E-05	4.95E-05
500	***5.12***	***5.30***	4.95	0.1025	4.95E-05	***4.87E-06***	-4.46E-05	5.00E-05	5.02	0.1025	5.02E-05	***4.87E-06***	-4.53E-05	5.07E-05

Capsule	OC2	Specimen	73	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.49***	***0.97***	0	0.1000					0	0.1000				
100	***0.75***	***1.22***	0.25	0.1001	1.25E-05		-1.25E-05	1.30E-05	0.26	0.1001	1.30E-05		-1.30E-05	1.35E-05
200	***1.05***	***1.70***	0.73	0.1004	1.82E-05		-1.82E-05	1.87E-05	0.56	0.1003	1.40E-05		-1.40E-05	1.45E-05
300	***1.58***	***2.02***	1.05	0.1005	1.75E-05		-1.75E-05	1.80E-05	1.09	0.1005	1.82E-05		-1.82E-05	1.87E-05
400	***2.12***	***2.60***	1.63	0.1008	2.04E-05		-2.04E-05	2.09E-05	1.63	0.1008	2.04E-05		-2.04E-05	2.09E-05
500	***2.78***	***3.20***	2.23	0.1011	2.23E-05	***4.87E-06***	-1.74E-05	2.28E-05	2.29	0.1011	2.29E-05	***4.87E-06***	-1.80E-05	2.34E-05

Capsule	OC2	Specimen	79	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.00***	***1.55***	0	0.1000					0	0.1000				
100	***1.50***	***2.00***	0.45	0.1002	2.25E-05		-2.25E-05	2.30E-05	0.5	0.1003	2.50E-05		-2.50E-05	2.55E-05
200	***2.02***	***2.52***	0.97	0.1005	2.43E-05		-2.43E-05	2.48E-05	1.02	0.1005	2.55E-05		-2.55E-05	2.60E-05
300	***2.68***	***3.20***	1.65	0.1008	2.75E-05		-2.75E-05	2.80E-05	1.68	0.1008	2.80E-05		-2.80E-05	2.85E-05
400	***3.40***	***3.95***	2.4	0.1012	3.00E-05		-3.00E-05	3.05E-05	2.4	0.1012	3.00E-05		-3.00E-05	3.05E-05
500	***4.20***	***4.65***	3.1	0.1016	3.10E-05	***4.87E-06***	-2.61E-05	3.15E-05	3.2	0.1016	3.20E-05	***4.87E-06***	-2.71E-05	3.25E-05

Capsule	OC2	Specimen	67	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.10***	***0.35***	0	0.1000					0	0.1000				
100	***1.01***	***1.30***	0.95	0.1005	4.75E-05		-4.75E-05	4.80E-05	0.91	0.1005	4.55E-05		-4.55E-05	4.60E-05
200	***1.98***	***2.22***	1.87	0.1009	4.67E-05		-4.67E-05	4.72E-05	1.88	0.1009	4.70E-05		-4.70E-05	4.75E-05
300	***3.05***	***3.20***	2.85	0.1014	4.75E-05		-4.75E-05	4.80E-05	2.95	0.1015	4.92E-05		-4.92E-05	4.97E-05
400	***4.02***	***4.22***	3.87	0.1019	4.84E-05		-4.84E-05	4.89E-05	3.92	0.1020	4.90E-05		-4.90E-05	4.95E-05
500	***5.12***	***5.30***	4.95	0.1025	4.95E-05	***4.87E-06***	-4.46E-05	5.00E-05	5.02	0.1025	5.02E-05	***4.87E-06***	-4.53E-05	5.07E-05

Capsule	OC2	Specimen	73	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.49***	***0.97***	0	0.1000					0	0.1000				
100	***0.75***	***1.22***	0.25	0.1001	1.25E-05		-1.25E-05	1.30E-05	0.26	0.1001	1.30E-05		-1.30E-05	1.35E-05
200	***1.05***	***1.70***	0.73	0.1004	1.82E-05		-1.82E-05	1.87E-05	0.56	0.1003	1.40E-05		-1.40E-05	1.45E-05
300	***1.58***	***2.02***	1.05	0.1005	1.75E-05		-1.75E-05	1.80E-05	1.09	0.1005	1.82E-05		-1.82E-05	1.87E-05
400	***2.12***	***2.60***	1.63	0.1008	2.04E-05		-2.04E-05	2.09E-05	1.63	0.1008	2.04E-05		-2.04E-05	2.09E-05
500	***2.78***	***3.20***	2.23	0.1011	2.23E-05	***4.87E-06***	-1.74E-05	2.28E-05	2.29	0.1011	2.29E-05	***4.87E-06***	-1.80E-05	2.34E-05

Capsule	OC2	Specimen	79	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.00***	***1.55***	0	0.1000					0	0.1000				
100	***1.50***	***2.00***	0.45	0.1002	2.25E-05		-2.25E-05	2.30E-05	0.5	0.1003	2.50E-05		-2.50E-05	2.55E-05
200	***2.02***	***2.52***	0.97	0.1005	2.43E-05		-2.43E-05	2.48E-05	1.02	0.1005	2.55E-05		-2.55E-05	2.60E-05
300	***2.68***	***3.20***	1.65	0.1008	2.75E-05		-2.75E-05	2.80E-05	1.68	0.1008	2.80E-05		-2.80E-05	2.85E-05
400	***3.40***	***3.95***	2.4	0.1012	3.00E-05		-3.00E-05	3.05E-05	2.4	0.1012	3.00E-05		-3.00E-05	3.05E-05
500	***4.20***	***4.65***	3.1	0.1016	3.10E-05	***4.87E-06***	-2.61E-05	3.15E-05	3.2	0.1016	3.20E-05	***4.87E-06***	-2.71E-05	3.25E-05

Capsule	OC2	Specimen	67	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.10***	***0.35***	0	0.1000					0	0.1000				
100	***1.01***	***1.30***	0.95	0.1005	4.75E-05		-4.75E-05	4.80E-05	0.91	0.1005	4.55E-05		-4.55E-05	4.60E-05
200	***1.98***	***2.22***	1.87	0.1009	4.67E-05		-4.67E-05	4.72E-05	1.88	0.1009	4.70E-05		-4.70E-05	4.75E-05
300	***3.05***	***3.20***	2.85	0.1014	4.75E-05		-4.75E-05	4.80E-05	2.95	0.1015	4.92E-05		-4.92E-05	4.97E-05
400	***4.02***	***4.22***	3.87	0.1019	4.84E-05		-4.84E-05	4.89E-05	3.92	0.1020	4.90E-05		-4.90E-05	4.95E-05
500	***5.12***	***5.30***	4.95	0.1025	4.95E-05	***4.87E-06***	-4.46E-05	5.00E-05	5.02	0.1025	5.02E-05	***4.87E-06***	-4.53E-05	5.07E-05

Capsule	OC2	Specimen	73	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.49***	***0.97***	0	0.1000					0	0.1000				
100	***0.75***	***1.22***	0.25	0.1001	1.25E-05		-1.25E-05	1.30E-05	0.26	0.1001	1.30E-05		-1.30E-05	1.35E-05
200	***1.05***	***1.70***	0.73	0.1004	1.82E-05		-1.82E-05	1.87E-05	0.56	0.1003	1.40E-05		-1.40E-05	1.45E-05
300	***1.58***	***2.02***	1.05	0.1005	1.75E-05		-1.75E-05	1.80E-05	1.09	0.1005	1.82E-05		-1.82E-05	1.87E-05
400	***2.12***	***2.60***	1.63	0.1008	2.04E-05		-2.04E-05	2.09E-05	1.63	0.1008	2.04E-05		-2.04E-05	2.09E-05
500	***2.78***	***3.20***	2.23	0.1011	2.23E-05	***4.87E-06***	-1.74E-05	2.28E-05	2.29	0.1011	2.29E-05	***4.87E-06***	-1.80E-05	2.34E-05

Capsule	OC2	Specimen	79	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.00***	***1.55***	0	0.1000					0	0.1000				
100	***1.50***	***2.00***	0.45	0.1002	2.25E-05		-2.25E-05	2.30E-05	0.5	0.1003	2.50E-05		-2.50E-05	2.55E-05
200	***2.02***	***2.52***	0.97	0.1005	2.43E-05		-2.43E-05	2.48E-05	1.02	0.1005	2.55E-05		-2.55E-05	2.60E-05
300	***2.68***	***3.20***	1.65	0.1008	2.75E-05		-2.75E-05	2.80E-05	1.68	0.1008	2.80E-05		-2.80E-05	2.85E-05
400	***3.40***	***3.95***	2.4	0.1012	3.00E-05		-3.00E-05	3.05E-05	2.4	0.1012	3.00E-05		-3.00E-05	3.05E-05
500	***4.20***	***4.65***	3.1	0.1016	3.10E-05	***4.87E-06***	-2.61E-05	3.15E-05	3.2	0.1016	3.20E-05	***4.87E-06***	-2.71E-05	3.25E-05

Capsule	OC2	Specimen	67	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.10***	***0.35***	0	0.1000					0	0.1000				
100	***1.01***	***1.30***	0.95	0.1005	4.75E-05		-4.75E-05	4.80E-05	0.91	0.1005	4.55E-05		-4.55E-05	4.60E-05
200	***1.98***	***2.22***	1.87	0.1009	4.67E-05		-4.67E-05	4.72E-05	1.88	0.1009	4.70E-05		-4.70E-05	4.75E-05
300	***3.05***	***3.20***	2.85	0.1014	4.75E-05		-4.75E-05	4.80E-05	2.95	0.1015	4.92E-05		-4.92E-05	4.97E-05
400	***4.02***	***4.22***	3.87	0.1019	4.84E-05		-4.84E-05	4.89E-05	3.92	0.1020	4.90E-05		-4.90E-05	4.95E-05
500	***5.12***	***5.30***	4.95	0.1025	4.95E-05	***4.87E-06***	-4.46E-05	5.00E-05	5.02	0.1025	5.02E-05	***4.87E-06***	-4.53E-05	5.07E-05

Capsule	OC2	Specimen	73	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.49***	***0.97***	0	0.1000					0	0.1000				
100	***0.75***	***1.22***	0.25	0.1001	1.25E-05		-1.25E-05	1.30E-05	0.26	0.1001	1.30E-05		-1.30E-05	1.35E-05
200	***1.05***	***1.70***	0.73	0.1004	1.82E-05		-1.82E-05	1.87E-05	0.56	0.1003	1.40E-05		-1.40E-05	1.45E-05
300	***1.58***	***2.02***	1.05	0.1005	1.75E-05		-1.75E-05	1.80E-05	1.09	0.1005	1.82E-05		-1.82E-05	1.87E-05
400	***2.12***	***2.60***	1.63	0.1008	2.04E-05		-2.04E-05	2.09E-05	1.63	0.1008	2.04E-05		-2.04E-05	2.09E-05
500	***2.78***	***3.20***	2.23	0.1011	2.23E-05	***4.87E-06***	-1.74E-05	2.28E-05	2.29	0.1011	2.29E-05	***4.87E-06***	-1.80E-05	2.34E-05

Capsule	OC2	Specimen	79	Material	H-451									
Column	South	Length	0.1000	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.00***	***1.55***	0	0.1000					0	0.1000				
100	***1.50***	***2.00***	0.45	0.1002	2.25E-05		-2.25E-05	2.30E-05	0.5	0.1003	2.50E-05		-2.50E-05	2.55E-05
200	***2.02***	***2.52***	0.97	0.1005	2.43E-05		-2.43E-05	2.48E-05	1.02	0.1005	2.55E-05		-2.55E-05	2.60E-05
300	***2.68***	***3.20***	1.65	0.1008	2.75E-05		-2.75E-05	2.80E-05	1.68	0.1008	2.80E-05		-2.80E-05	2.85E-05
400	***3.40***	***3.95***	2.4	0.1012	3.00E-05		-3.00E-05	3.05E-05	2.4	0.1012	3.00E-05		-3.00E-05	3.05E-05
500	***4.20***	***4.65***	3.1	0.1016	3.10E-05	***4.87E-06***	-2.61E-05	3.15E-05	3.2	0.1016	3.20E-05	***4.87E-06***	-2.71E-05	3.25E-05

Capsule	OC2	Specimen	83	Material	H-451									
Column	North	Length	0.9992	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.73***	***1.30***	0	0.9992					0	0.9992				
100	***1.27***	***1.76***	0.46	0.9994	2.30E-06	***2.80E-06***	4.98E-07	2.80E-06	0.54	0.9995	2.70E-06	***2.70E+00***	2.70E+00	3.20E-06
200	***1.80***	***2.20***	0.9	0.9997	2.25E-06	***2.71E-06***	4.58E-07	2.75E-06	1.07	0.9997	2.68E-06	***2.94E+00***	2.93E+00	3.18E-06
300	***2.45***	***2.89***	1.59	1.0000	2.65E-06	***3.13E-06***	4.78E-07	3.15E-06	1.72	1.0001	2.87E-06	***3.18E+00***	3.18E+00	3.37E-06
400	***3.20***	***3.63***	2.33	1.0004	2.91E-06	***3.38E-06***	4.67E-07	3.41E-06	2.47	1.0004	3.09E-06	***3.40E+00***	3.39E+00	3.59E-06
500	***4.00***	***4.32***	3.02	1.0007	3.02E-06	***3.49E-06***	6.98E-07	3.52E-06	3.27	1.0008	3.27E-06	***3.61E+00***	3.61E+00	3.77E-06

Capsule	OC2	Specimen	88	Material	H-451									
Column	North	Length	0.9977	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.66***	***1.20***	0	0.9977					0	0.9977				
100	***1.10***	***1.48***	0.28	0.9978	1.40E-06	***1.90E-06***	4.97E-07	1.90E-06	0.44	0.9979	2.21E-06	***2.70E-06***	4.95E-07	2.71E-06
200	***1.65***	***1.90***	0.7	0.9981	1.75E-06	***2.21E-06***	4.56E-07	2.25E-06	0.99	0.9982	2.48E-06	***2.94E-06***	4.54E-07	2.98E-06
300	***2.28***	***2.60***	1.4	0.9984	2.34E-06	***2.81E-06***	4.74E-07	2.84E-06	1.62	0.9985	2.71E-06	***3.18E-06***	4.74E-07	3.21E-06
400	***3.00***	***3.35***	2.15	0.9988	2.69E-06	***3.16E-06***	4.63E-07	3.19E-06	2.34	0.9989	2.93E-06	***3.40E-06***	4.63E-07	3.43E-06
500	***3.80***	***4.10***	2.9	0.9992	2.91E-06	***3.37E-06***	5.73E-07	3.41E-06	3.14	0.9993	3.15E-06	***3.61E-06***	3.33E-07	3.65E-06

Capsule	OC2	Specimen	90	Material	H-451									
Column	North	Length	0.9983	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.40***	***0.98***	0	0.9983					0	0.9983				
100	***1.00***	***1.38***	0.4	0.9985	2.00E-06		-2.00E-06	2.50E-06	0.6	0.9986	3.01E-06		-3.01E-06	3.51E-06
200	***1.45***	***1.81***	0.83	0.9987	2.08E-06		-2.08E-06	2.58E-06	1.05	0.9988	2.63E-06		-2.63E-06	3.13E-06
300	***2.10***	***2.50***	1.52	0.9991	2.54E-06		-2.54E-06	3.04E-06	1.7	0.9992	2.84E-06		-2.84E-06	3.34E-06
400	***2.80***	***3.30***	2.32	0.9995	2.90E-06		-2.90E-06	3.40E-06	2.4	0.9995	3.01E-06		-3.01E-06	3.51E-06
500	***3.60***	***4.03***	3.05	0.9998	3.06E-06	***5.24E-06***	2.18E-06	3.56E-06	3.2	0.9999	3.21E-06	***5.24E-06***	2.03E-06	3.71E-06

OC4 Dilatometer Data

Capsule	OC4	Specimen	10	Material	H-451									
Column	West	Length	0.9883	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.13***	***1.50***	0	0.9883					0	0.9883				
100	***1.98***	***2.09***	0.59	0.9886	2.98E-06	***3.50E+00***	3.50E+00	3.48E-06	0.85	0.9887	4.30E-06	***4.80E+00***	4.80E+00	4.80E-06
200	***2.76***	***2.72***	1.22	0.9889	3.09E-06	***3.60E+00***	3.60E+00	3.59E-06	1.63	0.9891	4.12E-06	***4.62E+00***	4.62E+00	4.62E-06
300	***3.50***	***3.43***	1.93	0.9893	3.25E-06	***3.77E+00***	3.77E+00	3.75E-06	2.37	0.9895	4.00E-06	***4.50E+00***	4.50E+00	4.50E-06
400	***4.21***	***4.28***	2.78	0.9897	3.52E-06	***4.02E+00***	4.02E+00	4.02E-06	3.08	0.9898	3.90E-06	***4.40E+00***	4.40E+00	4.40E-06
500	***5.17***	***5.34***	3.84	0.9902	3.89E-06	***4.39E+00***	4.39E+00	4.39E-06	4.04	0.9903	4.09E-06	***4.59E+00***	4.59E+00	4.59E-06

Capsule	OC4	Specimen	16	Material	H-451									
Column	West	Length	0.9825	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.08***	***0.93***	0	0.9825					0	0.9825				
100	***1.92***	***1.64***	0.71	0.9829	3.61E-06	***4.10E-06***	4.87E-07	4.11E-06	0.84	0.9829	4.27E-06	***4.75E-06***	4.75E-07	4.77E-06
200	***2.80***	***2.38***	1.45	0.9832	3.69E-06	***4.17E-06***	4.80E-07	4.19E-06	1.72	0.9834	4.38E-06	***4.85E-06***	4.73E-07	4.88E-06
300	***3.50***	***3.22***	2.29	0.9836	3.88E-06	***4.37E-06***	4.85E-07	4.38E-06	2.42	0.9837	4.11E-06	***4.58E-06***	4.75E-07	4.61E-06
400	***3.98***	***3.98***	3.05	0.9840	3.88E-06	***4.36E-06***	4.80E-07	4.38E-06	2.9	0.9840	3.69E-06	***4.18E-06***	4.90E-07	4.19E-06
500	***4.75***	***4.88***	3.95	0.9845	4.02E-06	***4.50E-06***	4.80E-07	4.52E-06	3.67	0.9843	3.74E-06	***4.22E-06***	4.85E-07	4.24E-06

Capsule	OC4	Specimen	19	Material	H-451									
Column	West	Length	0.9955	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.90***	***1.38***	0	0.9955					0	0.9955				
100	***1.59***	***1.90***	0.52	0.9958	2.61E-06	***3.15E-06***	5.38E-07	3.11E-06	0.69	0.9958	3.47E-06	***4.00E-06***	5.34E-07	3.97E-06
200	***2.28***	***2.45***	1.07	0.9960	2.69E-06	***3.22E-06***	5.33E-07	3.19E-06	1.38	0.9962	3.47E-06	***4.00E-06***	5.34E-07	3.97E-06
300	***2.79***	***3.01***	1.63	0.9963	2.73E-06	***3.27E-06***	5.41E-07	3.23E-06	1.89	0.9964	3.16E-06	***3.70E-06***	5.36E-07	3.66E-06
400	***3.42***	***3.57***	2.19	0.9966	2.75E-06	***3.29E-06***	5.40E-07	3.25E-06	2.52	0.9968	3.16E-06	***3.70E-06***	5.36E-07	3.66E-06
500	***4.03***	***4.15***	2.77	0.9969	2.78E-06	***3.32E-06***	5.37E-07	3.28E-06	3.13	0.9971	3.14E-06	***3.68E-06***	5.36E-07	3.64E-06

Capsule	OC4	Specimen	26	Material	H-451									
Column	West	Length	0.9813	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.95***	***1.27***	0	0.9813					0	0.9813				
100	***1.75***	***1.90***	0.63	0.9816	3.21E-06	***3.70E-06***	4.90E-07	3.71E-06	0.8	0.9817	4.08E-06	***4.55E-06***	4.74E-07	4.58E-06
200	***2.50***	***2.50***	1.23	0.9819	3.13E-06	***3.62E-06***	4.86E-07	3.63E-06	1.55	0.9821	3.95E-06	***4.42E-06***	4.71E-07	4.45E-06
300	***3.02***	***3.23***	1.96	0.9823	3.33E-06	***3.82E-06***	4.91E-07	3.83E-06	2.07	0.9823	3.52E-06	***4.00E-06***	4.84E-07	4.02E-06
400	***3.75***	***3.90***	2.63	0.9826	3.35E-06	***3.84E-06***	4.90E-07	3.85E-06	2.8	0.9827	3.57E-06	***4.05E-06***	4.83E-07	4.07E-06
500	***4.50***	***4.65***	3.38	0.9830	3.44E-06	***3.93E-06***	4.86E-07	3.94E-06	3.55	0.9831	3.62E-06	***4.10E-06***	4.82E-07	4.12E-06

Capsule	OC4	Specimen	27	Material	H-451									
Column	West	Length	0.9833	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.51***	***1.87***	0	0.9833					0	0.9833				
100	***2.35***	***2.50***	0.63	0.9836	3.20E-06	***3.70E-06***	4.97E-07	3.70E-06	0.84	0.9837	4.27E-06	***4.75E-06***	4.79E-07	4.77E-06
200	***3.10***	***3.20***	1.33	0.9840	3.38E-06	***3.88E-06***	4.99E-07	3.88E-06	1.59	0.9841	4.04E-06	***4.52E-06***	4.77E-07	4.54E-06
300	***3.78***	***3.78***	1.91	0.9843	3.24E-06	***3.73E-06***	4.93E-07	3.74E-06	2.27	0.9844	3.85E-06	***4.33E-06***	4.82E-07	4.35E-06
400	***4.39***	***4.42***	2.55	0.9846	3.24E-06	***3.73E-06***	4.88E-07	3.74E-06	2.88	0.9847	3.66E-06	***4.15E-06***	4.89E-07	4.16E-06
500	***5.10***	***5.20***	3.33	0.9850	3.39E-06	***3.88E-06***	4.93E-07	3.89E-06	3.59	0.9851	3.65E-06	***4.14E-06***	4.89E-07	4.15E-06

Capsule	OC4	Specimen	31	Material	H-451									
Column	West	Length	0.9795	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.83***	***1.24***	0	0.9795					0	0.9795				
100	***1.87***	***1.98***	0.74	0.9799	3.78E-06	***4.25E-06***	4.73E-07	4.28E-06	1.04	0.9800	5.31E-06	***5.75E-06***	4.41E-07	5.81E-06
200	***2.77***	***2.81***	1.57	0.9803	4.01E-06	***4.48E-06***	4.73E-07	4.51E-06	1.94	0.9805	4.95E-06	***5.40E-06***	4.48E-07	5.45E-06
300	***3.61***	***3.62***	2.38	0.9807	4.05E-06	***4.52E-06***	4.70E-07	4.55E-06	2.78	0.9809	4.73E-06	***5.18E-06***	4.50E-07	5.23E-06
400	***4.45***	***4.45***	3.21	0.9811	4.10E-06	***4.56E-06***	4.64E-07	4.60E-06	3.62	0.9813	4.62E-06	***5.07E-06***	4.50E-07	5.12E-06
500	***5.40***	***5.48***	4.24	0.9816	4.33E-06	***4.79E-06***	4.61E-07	4.83E-06	4.57	0.9818	4.67E-06	***5.20E-06***	5.34E-07	5.17E-06

Capsule	OC4	Specimen	41	Material	H-451									
Column	West	Length	0.9854	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.17***	***1.92***	0	0.9854					0	0.9854				
100	***2.00***	***2.42***	0.5	0.9857	2.54E-06	***3.05E-06***	5.13E-07	3.04E-06	0.83	0.9858	4.21E-06	***4.70E-06***	4.89E-07	4.71E-06
200	***2.88***	***3.02***	1.1	0.9860	2.79E-06	***3.30E-06***	5.09E-07	3.29E-06	1.71	0.9863	4.34E-06	***4.82E-06***	4.82E-07	4.84E-06
300	***3.67***	***3.75***	1.83	0.9863	3.10E-06	***3.60E-06***	5.05E-07	3.60E-06	2.5	0.9867	4.23E-06	***4.72E-06***	4.92E-07	4.73E-06
400	***4.38***	***4.50***	2.58	0.9867	3.27E-06	***3.78E-06***	5.07E-07	3.77E-06	3.21	0.9870	4.07E-06	***4.56E-06***	4.88E-07	4.57E-06
500	***5.05***	***5.50***	3.58	0.9872	3.63E-06	***4.13E-06***	4.97E-07	4.13E-06	3.88	0.9873	3.94E-06	***4.43E-06***	4.93E-07	4.44E-06

Capsule	OC4	Specimen	43	Material	H-451									
Column	West	Length	0.9828	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.75***	***1.50***	0	0.9828					0	0.9828				
100	***2.37***	***2.17***	0.67	0.9831	3.41E-06	***3.90E-06***	4.91E-07	3.91E-06	0.62	0.9831	3.15E-06	***3.65E-06***	4.96E-07	3.65E-06
200	***3.00***	***2.88***	1.38	0.9835	3.51E-06	***4.00E-06***	4.90E-07	4.01E-06	1.25	0.9834	3.18E-06	***3.68E-06***	5.00E-07	3.68E-06
300	***3.64***	***3.64***	2.14	0.9839	3.63E-06	***4.12E-06***	4.91E-07	4.13E-06	1.89	0.9837	3.21E-06	***3.70E-06***	4.95E-07	3.71E-06
400	***4.29***	***4.35***	2.85	0.9842	3.62E-06	***4.11E-06***	4.85E-07	4.12E-06	2.54	0.9841	3.23E-06	***3.72E-06***	4.89E-07	3.73E-06
500	***5.18***	***5.18***	3.68	0.9846	3.74E-06	***4.23E-06***	4.86E-07	4.24E-06	3.43	0.9845	3.49E-06	***3.98E-06***	4.90E-07	3.99E-06

Capsule	OC4	Specimen	45	Material	H-451									
Column	West	Length	0.9881	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.90***	***0.69***	0	0.9881					0	0.9881				
100	***1.65***	***1.38***	0.69	0.9884	3.49E-06	***4.00E-06***	5.08E-07	3.99E-06	0.75	0.9885	3.80E-06	***4.30E-06***	5.05E-07	4.30E-06
200	***2.40***	***2.11***	1.42	0.9888	3.59E-06	***4.10E-06***	5.07E-07	4.09E-06	1.5	0.9889	3.80E-06	***4.30E-06***	5.05E-07	4.30E-06
300	***3.05***	***2.95***	2.26	0.9892	3.81E-06	***4.32E-06***	5.08E-07	4.31E-06	2.15	0.9892	3.63E-06	***4.13E-06***	5.04E-07	4.13E-06
400	***3.78***	***3.78***	3.09	0.9896	3.91E-06	***4.41E-06***	5.01E-07	4.41E-06	2.88	0.9895	3.64E-06	***4.15E-06***	5.07E-07	4.14E-06
500	***4.57***	***4.57***	3.88	0.9900	3.93E-06	***4.43E-06***	5.03E-07	4.43E-06	3.67	0.9899	3.71E-06	***4.22E-06***	5.06E-07	4.21E-06

Capsule	OC4	Specimen	47	Material	H-451									
Column	West	Length	0.9815	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.47***	***2.05***	0	0.9815					0	0.9815				
100	***2.44***	***2.75***	0.7	0.9819	3.57E-06	***4.05E-06***	4.84E-07	4.07E-06	0.97	0.9820	4.94E-06	***5.40E-06***	4.59E-07	5.44E-06
200	***3.30***	***3.62***	1.57	0.9823	4.00E-06	***4.48E-06***	4.81E-07	4.50E-06	1.83	0.9824	4.66E-06	***5.12E-06***	4.59E-07	5.16E-06
300	***4.03***	***4.30***	2.25	0.9826	3.82E-06	***4.30E-06***	4.79E-07	4.32E-06	2.56	0.9828	4.35E-06	***4.82E-06***	4.73E-07	4.85E-06
400	***4.70***	***4.90***	2.85	0.9829	3.63E-06	***4.11E-06***	4.80E-07	4.13E-06	3.23	0.9831	4.11E-06	***4.59E-06***	4.76E-07	4.61E-06
500	***5.50***	***5.62***	3.57	0.9833	3.64E-06	***4.12E-06***	4.83E-07	4.14E-06	4.03	0.9835	4.11E-06	***4.58E-06***	4.74E-07	4.61E-06

Capsule	OC4	Specimen	56	Material	H-451									
Column	West	Length	0.9776	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.05***	***1.47***	0	0.9776					0	0.9776				
100	***1.87***	***2.25***	0.78	0.9780	3.99E-06	***4.45E-06***	4.61E-07	4.49E-06	0.82	0.9780	4.19E-06	***4.65E-06***	4.56E-07	4.69E-06
200	***2.65***	***3.05***	1.58	0.9784	4.04E-06	***4.50E-06***	4.59E-07	4.54E-06	1.6	0.9784	4.09E-06	***4.55E-06***	4.58E-07	4.59E-06
300	***3.45***	***4.02***	2.55	0.9789	4.35E-06	***4.80E-06***	4.53E-07	4.85E-06	2.4	0.9788	4.09E-06	***4.55E-06***	4.58E-07	4.59E-06
400	***4.40***	***4.90***	3.43	0.9793	4.39E-06	***4.84E-06***	4.54E-07	4.89E-06	3.35	0.9793	4.28E-06	***4.74E-06***	4.57E-07	4.78E-06
500	***5.42***	***5.87***	4.4	0.9798	4.50E-06	***4.95E-06***	4.49E-07	5.00E-06	4.37	0.9798	4.47E-06	***4.92E-06***	4.50E-07	4.97E-06

Capsule	OC4	Specimen	58	Material	H-451									
Column	West	Length	0.9751	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.82***	***1.08***	0	0.9751					0	0.9751				
100	***1.60***	***1.80***	0.72	0.9755	3.69E-06	***4.15E-06***	4.58E-07	4.19E-06	0.78	0.9755	4.00E-06	***4.45E-06***	4.50E-07	4.50E-06
200	***2.45***	***2.62***	1.54	0.9759	3.95E-06	***4.40E-06***	4.52E-07	4.45E-06	1.63	0.9759	4.18E-06	***4.62E-06***	4.41E-07	4.68E-06
300	***3.35***	***3.50***	2.42	0.9763	4.14E-06	***4.58E-06***	4.44E-07	4.64E-06	2.53	0.9764	4.32E-06	***4.77E-06***	4.46E-07	4.82E-06
400	***4.31***	***4.45***	3.37	0.9768	4.32E-06	***4.76E-06***	4.40E-07	4.82E-06	3.49	0.9768	4.47E-06	***4.91E-06***	4.36E-07	4.97E-06
500	***5.30***	***5.42***	4.34	0.9773	4.45E-06	***4.89E-06***	4.39E-07	4.95E-06	4.48	0.9773	4.59E-06	***5.03E-06***	4.36E-07	5.09E-06

Capsule	OC4	Specimen	60	Material	H-451									
Column	West	Length	0.9768	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.92***	***1.21***	0	0.9768					0	0.9768				
100	***1.68***	***1.95***	0.74	0.9772	3.79E-06	***4.25E-06***	4.62E-07	4.29E-06	0.76	0.9772	3.89E-06	***4.05E-06***	1.60E-07	4.39E-06
200	***2.51***	***2.78***	1.57	0.9776	4.02E-06	***4.48E-06***	4.62E-07	4.52E-06	1.59	0.9776	4.07E-06	***4.52E-06***	4.51E-07	4.57E-06
300	***3.40***	***3.67***	2.46	0.9780	4.20E-06	***4.65E-06***	4.53E-07	4.70E-06	2.48	0.9780	4.23E-06	***4.68E-06***	4.48E-07	4.73E-06
400	***4.39***	***4.60***	3.39	0.9785	4.34E-06	***4.79E-06***	4.52E-07	4.84E-06	3.47	0.9785	4.44E-06	***4.88E-06***	4.39E-07	4.94E-06
500	***5.38***	***5.60***	4.39	0.9790	4.49E-06	***4.94E-06***	4.46E-07	4.99E-06	4.46	0.9790	4.57E-06	***5.01E-06***	4.44E-07	5.07E-06

Capsule	OC4	Specimen	78	Material	H-451									
Column	North	Length	0.9958	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.58***	***0.93***	0	0.9958					0	0.9958				
100	***1.24***	***1.49***	0.56	0.9961	2.81E-06	***2.85E-06***	3.82E-08	3.31E-06	0.66	0.9961	3.31E-06	***4.00E-06***	6.86E-07	3.81E-06
200	***1.90***	***2.02***	1.09	0.9963	2.74E-06	***3.12E-06***	3.84E-07	3.24E-06	1.32	0.9965	3.31E-06	***3.95E-06***	6.36E-07	3.81E-06
300	***2.57***	***2.60***	1.67	0.9966	2.80E-06	***3.15E-06***	3.55E-07	3.30E-06	1.99	0.9968	3.33E-06	***3.82E-06***	4.89E-07	3.83E-06
400	***3.12***	***3.22***	2.29	0.9969	2.87E-06	***3.01E-06***	1.35E-07	3.37E-06	2.54	0.9971	3.19E-06	***3.84E-06***	6.52E-07	3.69E-06
500	***3.98***	***3.92***	2.99	0.9973	3.00E-06	***3.18E-06***	1.77E-07	3.50E-06	3.4	0.9975	3.41E-06	***3.89E-06***	4.76E-07	3.91E-06

Capsule	OC4	Specimen	79	Material	H-451									
Column	North	Length	0.9961	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.81***	***0.84***	0	0.9961					0	0.9961				
100	***1.40***	***1.38***	0.54	0.9964	2.71E-06	***3.25E-06***	5.39E-07	3.21E-06	0.59	0.9964	2.96E-06	***3.50E-06***	5.38E-07	3.46E-06
200	***1.94***	***1.90***	1.06	0.9966	2.66E-06	***3.20E-06***	5.40E-07	3.16E-06	1.13	0.9967	2.84E-06	***3.38E-06***	5.44E-07	3.34E-06
300	***2.49***	***2.54***	1.7	0.9970	2.84E-06	***3.38E-06***	5.36E-07	3.34E-06	1.68	0.9969	2.81E-06	***3.35E-06***	5.39E-07	3.31E-06
400	***3.02***	***3.24***	2.4	0.9973	3.01E-06	***3.55E-06***	5.38E-07	3.51E-06	2.21	0.9972	2.77E-06	***3.31E-06***	5.37E-07	3.27E-06
500	***3.63***	***3.82***	2.98	0.9976	2.99E-06	***3.53E-06***	5.38E-07	3.49E-06	2.82	0.9975	2.83E-06	***3.37E-06***	5.39E-07	3.33E-06

Capsule	OC4	Specimen	83	Material	H-451									
Column	North	Length	0.9957	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.32***	***1.77***	0	0.9957					0	0.9957				
100	***2.07***	***2.42***	0.65	0.9960	3.26E-06	***3.80E-06***	5.36E-07	3.76E-06	0.75	0.9961	3.77E-06	***4.30E-06***	5.34E-07	4.27E-06
200	***2.72***	***2.98***	1.21	0.9963	3.04E-06	***3.58E-06***	5.42E-07	3.54E-06	1.4	0.9964	3.52E-06	***4.05E-06***	5.35E-07	4.02E-06
300	***3.14***	***3.50***	1.73	0.9966	2.90E-06	***3.43E-06***	5.34E-07	3.40E-06	1.82	0.9966	3.05E-06	***3.58E-06***	5.34E-07	3.55E-06
400	***3.64***	***4.02***	2.25	0.9968	2.82E-06	***3.36E-06***	5.35E-07	3.32E-06	2.32	0.9969	2.91E-06	***3.45E-06***	5.37E-07	3.41E-06
500	***4.20***	***4.48***	2.71	0.9971	2.72E-06	***3.26E-06***	5.38E-07	3.22E-06	2.88	0.9971	2.89E-06	***3.43E-06***	5.38E-07	3.39E-06

Capsule	OC4	Specimen	84	Material	H-451									
Column	North	Length	0.9947	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.72***	***0.60***	0	0.9947					0	0.9947				
100	***1.41***	***1.15***	0.55	0.9950	2.76E-06	***3.30E-06***	5.35E-07	3.26E-06	0.69	0.9950	3.47E-06	***4.00E-06***	5.32E-07	3.97E-06
200	***2.03***	***1.72***	1.12	0.9953	2.81E-06	***3.35E-06***	5.35E-07	3.31E-06	1.31	0.9954	3.29E-06	***3.83E-06***	5.38E-07	3.79E-06
300	***2.45***	***2.35***	1.75	0.9956	2.93E-06	***3.47E-06***	5.38E-07	3.43E-06	1.73	0.9956	2.90E-06	***3.43E-06***	5.31E-07	3.40E-06
400	***3.02***	***3.02***	2.42	0.9959	3.04E-06	***3.58E-06***	5.39E-07	3.54E-06	2.3	0.9959	2.89E-06	***3.43E-06***	5.40E-07	3.39E-06
500	***3.65***	***3.70***	3.1	0.9963	3.12E-06	***3.65E-06***	5.33E-07	3.62E-06	2.93	0.9962	2.95E-06	***3.48E-06***	5.34E-07	3.45E-06

Capsule	OC4	Specimen	88	Material	H-451									
Column	North	Length	0.9961	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.05***	***1.99***	0	0.9939					0	0.9939				
100	***1.78***	***2.49***	0.5	0.9942	2.52E-06	***3.05E-06***	5.35E-07	3.02E-06	0.73	0.9943	3.67E-06	***4.20E-06***	5.28E-07	4.17E-06
200	***2.40***	***2.95***	0.96	0.9944	2.41E-06	***2.95E-06***	5.35E-07	2.91E-06	1.35	0.9946	3.40E-06	***3.92E-06***	5.24E-07	3.90E-06
300	***2.86***	***3.31***	1.32	0.9946	2.21E-06	***2.75E-06***	5.36E-07	2.71E-06	1.81	0.9948	3.04E-06	***3.57E-06***	5.35E-07	3.54E-06
400	***3.48***	***3.72***	1.73	0.9948	2.18E-06	***2.55E-06***	3.74E-07	2.68E-06	2.43	0.9951	3.06E-06	***3.59E-06***	5.34E-07	3.56E-06
500	***4.18***	***4.28***	2.29	0.9950	2.30E-06	***2.24E-06***	-6.41E-08	2.80E-06	3.13	0.9955	3.15E-06	***3.68E-06***	5.31E-07	3.65E-06

Capsule	OC4	Specimen	89	Material	H-451									
Column	North	Length	0.9940	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.86***	***0.55***	0	0.9940					0	0.9940				
100	***1.40***	***1.04***	0.49	0.9942	2.46E-06	***3.00E-06***	5.35E-07	2.96E-06	0.54	0.9943	2.72E-06	***3.25E-06***	5.34E-07	3.22E-06
200	***1.97***	***1.60***	1.05	0.9945	2.64E-06	***3.18E-06***	5.39E-07	3.14E-06	1.11	0.9946	2.79E-06	***3.33E-06***	5.38E-07	3.29E-06
300	***2.39***	***2.22***	1.67	0.9948	2.80E-06	***3.33E-06***	5.30E-07	3.30E-06	1.53	0.9948	2.57E-06	***3.10E-06***	5.35E-07	3.07E-06
400	***2.83***	***2.87***	2.32	0.9952	2.92E-06	***3.45E-06***	5.32E-07	3.42E-06	1.97	0.9950	2.48E-06	***3.01E-06***	5.33E-07	2.98E-06
500	***3.46***	***3.50***	2.95	0.9955	2.97E-06	***3.50E-06***	5.32E-07	3.47E-06	2.6	0.9953	2.62E-06	***3.15E-06***	5.34E-07	3.12E-06

Capsule	OC4	Specimen	90	Material	H-451									
Column	North	Length	0.995	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.25***	***1.45***	0	0.9950					0	0.9950				
100	***1.98***	***2.00***	0.55	0.9953	2.76E-06	***3.30E-06***	5.36E-07	3.26E-06	0.73	0.9954	3.67E-06	***4.20E-06***	5.32E-07	4.17E-06
200	***2.56***	***2.56***	1.11	0.9956	2.79E-06	***3.32E-06***	5.31E-07	3.29E-06	1.31	0.9957	3.29E-06	***3.83E-06***	5.39E-07	3.79E-06
300	***3.10***	***3.22***	1.77	0.9959	2.96E-06	***3.50E-06***	5.35E-07	3.46E-06	1.85	0.9959	3.10E-06	***3.63E-06***	5.31E-07	3.60E-06
400	***3.75***	***3.90***	2.45	0.9962	3.08E-06	***3.61E-06***	5.32E-07	3.58E-06	2.5	0.9963	3.14E-06	***3.68E-06***	5.39E-07	3.64E-06
500	***4.48***	***4.60***	3.15	0.9966	3.17E-06	***3.70E-06***	5.34E-07	3.67E-06	3.23	0.9966	3.25E-06	***3.78E-06***	5.34E-07	3.75E-06

Capsule	OC4	Specimen	93	Material	H-451									
Column	North	Length	0.995	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.90***	***1.39***	0	0.9950					0	0.9950				
100	***1.65***	***2.05***	0.66	0.9953	3.32E-06	***3.85E-06***	5.33E-07	3.82E-06	0.75	0.9954	3.77E-06	***3.75E-06***	-1.88E-08	4.27E-06
200	***2.44***	***2.72***	1.33	0.9957	3.34E-06	***3.88E-06***	5.38E-07	3.84E-06	1.54	0.9958	3.87E-06	***3.85E-06***	-1.93E-08	4.37E-06
300	***3.28***	***3.50***	2.11	0.9961	3.53E-06	***4.07E-06***	5.36E-07	4.03E-06	2.38	0.9962	3.99E-06	***3.97E-06***	-1.66E-08	4.49E-06
400	***4.19***	***4.28***	2.89	0.9964	3.63E-06	***4.16E-06***	5.29E-07	4.13E-06	3.29	0.9966	4.13E-06	***4.11E-06***	-2.32E-08	4.63E-06
500	***5.25***	***5.14***	3.75	0.9969	3.77E-06	***4.30E-06***	5.31E-07	4.27E-06	4.35	0.9972	4.37E-06	***4.35E-06***	-2.19E-08	4.87E-06

Capsule	OC4	Specimen	94	Material	H-451									
Column	South	Length	0.9959	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.75***	***0.73***	0	0.9959					0	0.9959				
100	***1.46***	***1.40***	0.67	0.9962	3.36E-06	***3.90E-06***	5.36E-07	3.86E-06	0.71	0.9963	3.56E-06	***4.10E-06***	5.35E-07	4.06E-06
200	***2.32***	***2.09***	1.36	0.9966	3.41E-06	***3.95E-06***	5.36E-07	3.91E-06	1.57	0.9967	3.94E-06	***4.48E-06***	5.39E-07	4.44E-06
300	***2.88***	***2.83***	2.1	0.9970	3.51E-06	***1.05E-06***	-2.46E-06	4.01E-06	2.13	0.9970	3.56E-06	***4.10E-06***	5.35E-07	4.06E-06
400	***3.51***	***3.62***	2.89	0.9973	3.63E-06	***4.16E-06***	5.33E-07	4.13E-06	2.76	0.9973	3.46E-06	***4.00E-06***	5.36E-07	3.96E-06
500	***4.28***	***4.38***	3.65	0.9977	3.67E-06	***4.20E-06***	5.35E-07	4.17E-06	3.53	0.9977	3.54E-06	***4.08E-06***	5.35E-07	4.04E-06

Capsule	OC4	Specimen	103	Material	H-451									
Column	North	Length	0.9961	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.20***	***1.76***	0	0.9961					0	0.9961				
100	***2.00***	***2.22***	0.46	0.9963	2.31E-06	***2.85E-06***	5.41E-07	2.81E-06	0.8	0.9965	4.02E-06	***4.55E-06***	5.34E-07	4.52E-06
200	***2.56***	***2.70***	0.94	0.9966	2.36E-06	***2.90E-06***	5.41E-07	2.86E-06	1.36	0.9968	3.41E-06	***3.95E-06***	5.37E-07	3.91E-06
300	***3.02***	***3.20***	1.44	0.9968	2.41E-06	***2.95E-06***	5.41E-07	2.91E-06	1.82	0.9970	3.05E-06	***3.58E-06***	5.35E-07	3.55E-06
400	***3.50***	***3.71***	1.95	0.9971	2.45E-06	***2.99E-06***	5.43E-07	2.95E-06	2.3	0.9973	2.89E-06	***3.42E-06***	5.34E-07	3.39E-06
500	***4.10***	***4.27***	2.51	0.9974	2.52E-06	***3.06E-06***	5.40E-07	3.02E-06	2.9	0.9976	2.91E-06	***3.45E-06***	5.39E-07	3.41E-06

Capsule	OC4	Specimen	104	Material	H-451									
Column	South	Length	0.9976	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.83***	***1.10***	0	0.9976					0	0.9976				
100	***1.71***	***1.62***	0.52	0.9979	2.61E-06	***3.15E-06***	5.44E-07	3.11E-06	0.88	0.9980	4.41E-06	***4.95E-06***	5.39E-07	4.91E-06
200	***2.48***	***2.22***	1.12	0.9982	2.81E-06	***3.35E-06***	5.43E-07	3.31E-06	1.65	0.9984	4.13E-06	***4.68E-06***	5.45E-07	4.63E-06
300	***2.88***	***2.80***	1.7	0.9985	2.84E-06	***3.35E-06***	5.10E-07	3.34E-06	2.05	0.9986	3.42E-06	***3.97E-06***	5.45E-07	3.92E-06
400	***3.33***	***3.36***	2.26	0.9987	2.83E-06	***3.38E-06***	5.48E-07	3.33E-06	2.5	0.9989	3.13E-06	***3.68E-06***	5.47E-07	3.63E-06
500	***3.94***	***3.94***	2.84	0.9990	2.85E-06	***3.39E-06***	5.43E-07	3.35E-06	3.11	0.9992	3.12E-06	***3.66E-06***	5.43E-07	3.62E-06

Capsule	OC4	Specimen	105	Material	H-451									
Column	North	Length	0.9768	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.14***	***1.32***	0	0.9952					0	0.9952				
100	***1.80***	***1.85***	0.53	0.9955	2.66E-06	***4.95E-06***	2.29E-06	3.16E-06	0.66	0.9955	3.32E-06	***3.85E-06***	5.34E-07	3.82E-06
200	***2.39***	***2.35***	1.03	0.9957	2.59E-06	***4.68E-06***	2.09E-06	3.09E-06	1.25	0.9958	3.14E-06	***3.68E-06***	5.40E-07	3.64E-06
300	***2.85***	***2.95***	1.63	0.9960	2.73E-06	***3.97E-06***	1.24E-06	3.23E-06	1.71	0.9961	2.86E-06	***3.40E-06***	5.36E-07	3.36E-06
400	***3.27***	***3.51***	2.19	0.9963	2.75E-06	***3.68E-06***	9.29E-07	3.25E-06	2.13	0.9963	2.68E-06	***3.22E-06***	5.45E-07	3.18E-06
500	***3.95***	***4.10***	2.78	0.9966	2.79E-06	***3.66E-06***	8.67E-07	3.29E-06	2.81	0.9966	2.82E-06	***3.36E-06***	5.36E-07	3.32E-06

Capsule	OC4	Specimen	106	Material	H-451									
Column	South	Length	0.9946	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.85***	***1.11***	0	0.9946					0	0.9946				
100	***1.54***	***1.67***	0.56	0.9949	2.82E-06	***3.35E-06***	5.35E-07	3.32E-06	0.69	0.9949	3.47E-06	***4.00E-06***	5.31E-07	3.97E-06
200	***2.22***	***2.22***	1.11	0.9952	2.79E-06	***3.32E-06***	5.30E-07	3.29E-06	1.37	0.9953	3.44E-06	***3.98E-06***	5.36E-07	3.94E-06
300	***2.65***	***2.84***	1.73	0.9955	2.90E-06	***3.43E-06***	5.31E-07	3.40E-06	1.8	0.9955	3.02E-06	***3.55E-06***	5.34E-07	3.52E-06
400	***3.22***	***3.40***	2.29	0.9957	2.88E-06	***3.41E-06***	5.32E-07	3.38E-06	2.37	0.9958	2.98E-06	***3.51E-06***	5.31E-07	3.48E-06
500	***3.81***	***3.95***	2.84	0.9960	2.86E-06	***3.39E-06***	5.35E-07	3.36E-06	2.96	0.9961	2.98E-06	***3.51E-06***	5.34E-07	3.48E-06

Capsule	OC4	Specimen	107	Material	H-451									
Column	South	Length	0.9961	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.79***	***1.29***	0	0.9976					0	0.9976				
100	***1.57***	***1.85***	0.56	0.9979	2.81E-06	***3.35E-06***	5.43E-07	3.31E-06	0.78	0.9980	3.91E-06	***4.45E-06***	5.41E-07	4.41E-06
200	***2.19***	***2.35***	1.06	0.9981	2.66E-06	***3.20E-06***	5.44E-07	3.16E-06	1.4	0.9983	3.51E-06	***4.05E-06***	5.42E-07	4.01E-06
300	***2.40***	***2.88***	1.59	0.9984	2.66E-06	***3.20E-06***	5.44E-07	3.16E-06	1.61	0.9984	2.69E-06	***3.23E-06***	5.40E-07	3.19E-06
400	***2.92***	***3.30***	2.01	0.9986	2.52E-06	***3.06E-06***	5.41E-07	3.02E-06	2.13	0.9987	2.67E-06	***3.21E-06***	5.41E-07	3.17E-06
500	***3.60***	***3.75***	2.46	0.9988	2.47E-06	***3.01E-06***	5.44E-07	2.97E-06	2.81	0.9990	2.82E-06	***3.36E-06***	5.43E-07	3.32E-06

Capsule	OC4	Specimen	108	Material	H-451									
Column	South	Length	0.998	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.07***	***1.65***	0	0.9980					0	0.9980				
100	***1.85***	***2.25***	0.6	0.9983	3.01E-06	***3.55E-06***	5.44E-07	3.51E-06	0.78	0.9984	3.91E-06	***4.45E-06***	5.42E-07	4.41E-06
200	***2.53***	***2.85***	1.2	0.9986	3.01E-06	***3.55E-06***	5.44E-07	3.51E-06	1.46	0.9987	3.66E-06	***4.72E-06***	1.06E-06	4.16E-06
300	***3.05***	***3.45***	1.8	0.9989	3.01E-06	***3.55E-06***	5.44E-07	3.51E-06	1.98	0.9990	3.31E-06	***3.85E-06***	5.43E-07	3.81E-06
400	***3.72***	***4.08***	2.43	0.9992	3.04E-06	***3.59E-06***	5.46E-07	3.54E-06	2.65	0.9993	3.32E-06	***3.86E-06***	5.41E-07	3.82E-06
500	***4.50***	***4.70***	3.05	0.9995	3.06E-06	***3.60E-06***	5.44E-07	3.56E-06	3.43	0.9997	3.44E-06	***3.98E-06***	5.43E-07	3.94E-06

Capsule	OC4	Specimen	110	Material	H-451									
Column	South	Length	0.9958	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.78***	***1.50***	0	0.9944					0	0.9944				
100	***1.60***	***2.02***	0.52	0.9947	2.61E-06	***3.15E-06***	5.35E-07	3.11E-06	0.82	0.9948	4.12E-06	***4.65E-06***	5.27E-07	4.62E-06
200	***2.36***	***2.50***	1	0.9949	2.51E-06	***3.05E-06***	5.36E-07	3.01E-06	1.58	0.9952	3.97E-06	***4.50E-06***	5.28E-07	4.47E-06
300	***2.52***	***3.01***	1.51	0.9952	2.53E-06	***3.07E-06***	5.39E-07	3.03E-06	1.74	0.9953	2.92E-06	***3.45E-06***	5.34E-07	3.42E-06
400	***3.12***	***3.42***	1.92	0.9954	2.41E-06	***2.95E-06***	5.36E-07	2.91E-06	2.34	0.9956	2.94E-06	***3.48E-06***	5.39E-07	3.44E-06
500	***3.78***	***3.90***	2.4	0.9956	2.41E-06	***2.95E-06***	5.36E-07	2.91E-06	3	0.9959	3.02E-06	***3.55E-06***	5.33E-07	3.52E-06

Capsule	OC4	Specimen	118	Material	H-451									
Column	North	Length	0.9944	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.40***	***1.60***	0	0.9944					0	0.9944				
100	***2.25***	***2.10***	0.5	0.9947	2.51E-06	***3.05E-06***	5.36E-07	3.01E-06	0.85	0.9948	4.27E-06	***4.80E-06***	5.26E-07	4.77E-06
200	***2.80***	***2.62***	1.02	0.9949	2.56E-06	***3.10E-06***	5.36E-07	3.06E-06	1.4	0.9951	3.52E-06	***4.05E-06***	5.30E-07	4.02E-06
300	***3.20***	***3.22***	1.62	0.9952	2.72E-06	***3.25E-06***	5.35E-07	3.22E-06	1.8	0.9953	3.02E-06	***3.55E-06***	5.33E-07	3.52E-06
400	***3.75***	***3.80***	2.2	0.9955	2.77E-06	***3.30E-06***	5.35E-07	3.27E-06	2.35	0.9956	2.95E-06	***3.49E-06***	5.36E-07	3.45E-06
500	***4.35***	***4.40***	2.8	0.9958	2.82E-06	***3.35E-06***	5.34E-07	3.32E-06	2.95	0.9959	2.97E-06	***3.50E-06***	5.33E-07	3.47E-06

Capsule	OC4	Specimen	120	Material	H-451									
Column	North	Length	0.9942	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.11***	***0.91***	0	0.9942					0	0.9942				
100	***1.73***	***1.53***	0.62	0.9945	3.12E-06	***3.65E-06***	5.32E-07	3.62E-06	0.62	0.9945	3.12E-06	***3.65E-06***	5.32E-07	3.62E-06
200	***2.40***	***2.13***	1.22	0.9948	3.07E-06	***3.60E-06***	5.32E-07	3.57E-06	1.29	0.9948	3.24E-06	***3.78E-06***	5.36E-07	3.74E-06
300	***2.85***	***2.78***	1.87	0.9951	3.13E-06	***3.67E-06***	5.35E-07	3.63E-06	1.74	0.9951	2.92E-06	***3.45E-06***	5.33E-07	3.42E-06
400	***3.38***	***3.30***	2.39	0.9954	3.00E-06	***3.54E-06***	5.35E-07	3.50E-06	2.27	0.9953	2.85E-06	***3.39E-06***	5.36E-07	3.35E-06
500	***3.98***	***4.03***	3.12	0.9958	3.14E-06	***3.67E-06***	5.32E-07	3.64E-06	2.87	0.9956	2.89E-06	***3.42E-06***	5.33E-07	3.39E-06

Capsule	OC4	Specimen	121	Material	H-451									
Column	South	Length	0.9946	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.15***	***1.90***	0	0.9946					0	0.9946				
100	***1.97***	***2.48***	0.58	0.9949	2.92E-06	***3.45E-06***	5.34E-07	3.42E-06	0.82	0.9950	4.12E-06	***4.65E-06***	5.28E-07	4.62E-06
200	***2.72***	***3.10***	1.2	0.9952	3.02E-06	***3.55E-06***	5.34E-07	3.52E-06	1.57	0.9954	3.95E-06	***4.48E-06***	5.34E-07	4.45E-06
300	***3.37***	***3.76***	1.86	0.9955	3.12E-06	***3.65E-06***	5.33E-07	3.62E-06	2.22	0.9957	3.72E-06	***4.25E-06***	5.30E-07	4.22E-06
400	***4.28***	***4.50***	2.6	0.9959	3.27E-06	***3.80E-06***	5.32E-07	3.77E-06	3.13	0.9962	3.93E-06	***4.46E-06***	5.26E-07	4.43E-06
500	***5.20***	***5.32***	3.42	0.9963	3.44E-06	***3.97E-06***	5.31E-07	3.94E-06	4.05	0.9966	4.07E-06	***4.60E-06***	5.28E-07	4.57E-06

Capsule	OC4	Specimen	122	Material	H-451									
Column	North	Length	0.9948	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.50***	***1.88***	0	0.9948					0	0.9948				
100	***2.24***	***2.45***	0.57	0.9951	2.86E-06	***3.40E-06***	5.35E-07	3.36E-06	0.74	0.9952	3.72E-06	***4.25E-06***	5.31E-07	4.22E-06
200	***2.90***	***3.02***	1.14	0.9954	2.86E-06	***3.40E-06***	5.35E-07	3.36E-06	1.4	0.9955	3.52E-06	***4.05E-06***	5.32E-07	4.02E-06
300	***3.32***	***3.60***	1.72	0.9957	2.88E-06	***3.42E-06***	5.38E-07	3.38E-06	1.82	0.9957	3.05E-06	***3.58E-06***	5.31E-07	3.55E-06
400	***3.86***	***4.12***	2.24	0.9959	2.81E-06	***3.35E-06***	5.35E-07	3.31E-06	2.36	0.9960	2.97E-06	***3.50E-06***	5.35E-07	3.47E-06
500	***4.52***	***4.72***	2.84	0.9962	2.85E-06	***3.39E-06***	5.35E-07	3.35E-06	3.02	0.9963	3.04E-06	***3.57E-06***	5.34E-07	3.54E-06

Capsule	OC4	Specimen	123	Material	H-451									
Column	South	Length	0.9953	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.59***	***1.79***	0	0.9953					0	0.9953				
100	***2.32***	***2.40***	0.61	0.9956	3.06E-06	***3.60E-06***	5.36E-07	3.56E-06	0.73	0.9957	3.67E-06	***4.20E-06***	5.33E-07	4.17E-06
200	***2.05***	***2.98***	1.19	0.9959	2.99E-06	***3.52E-06***	5.31E-07	3.49E-06	0.46	0.9955	1.16E-06	***4.20E-06***	3.04E-06	1.66E-06
300	***3.48***	***3.55***	1.76	0.9962	2.95E-06	***3.48E-06***	5.33E-07	3.45E-06	1.89	0.9962	3.16E-06	***3.70E-06***	5.35E-07	3.66E-06
400	***4.02***	***4.05***	2.26	0.9964	2.84E-06	***3.38E-06***	5.42E-07	3.34E-06	2.43	0.9965	3.05E-06	***3.59E-06***	5.38E-07	3.55E-06
500	***4.72***	***4.67***	2.88	0.9967	2.89E-06	***3.43E-06***	5.36E-07	3.39E-06	3.13	0.9969	3.14E-06	***3.68E-06***	5.35E-07	3.64E-06

Capsule	OC4	Specimen	4	Material	H-327									
Column	South	Length	0.9883	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.78***	***1.92***	0	0.9883					0	0.9883				
100	***2.15***	***2.05***	0.13	0.9884	6.58E-07	***1.20E-06***	5.42E-07	1.16E-06	0.37	0.9885	1.87E-06	***2.40E-06***	5.28E-07	2.37E-06
200	***2.49***	***2.22***	0.3	0.9885	7.59E-07	***1.30E-06***	5.41E-07	1.26E-06	0.71	0.9887	1.80E-06	***2.32E-06***	5.24E-07	2.30E-06
300	***2.72***	***2.44***	0.52	0.9886	8.77E-07	***1.42E-06***	5.43E-07	1.38E-06	0.94	0.9888	1.59E-06	***2.12E-06***	5.35E-07	2.09E-06
400	***2.87***	***2.72***	0.8	0.9887	1.01E-06	***1.55E-06***	5.38E-07	1.51E-06	1.09	0.9888	1.38E-06	***1.91E-06***	5.31E-07	1.88E-06
500	***3.18***	***3.12***	1.2	0.9889	1.21E-06	***1.75E-06***	5.36E-07	1.71E-06	1.4	0.9890	1.42E-06	***1.95E-06***	5.33E-07	1.92E-06

Capsule	OC4	Specimen	65	Material	H-451									
Column	North	Length	0.9968	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.32***	***0.99***	0	0.9968					0	0.9968				
100	***1.33***	***1.12***	0.13	0.9969	6.52E-07	***1.20E-06***	5.48E-07	1.15E-06	0.01	0.9968	5.02E-08	***6.00E-07***	5.50E-07	5.50E-07
200	***1.50***	***1.23***	0.24	0.9969	6.02E-07	***1.15E-06***	5.48E-07	1.10E-06	0.18	0.9969	4.51E-07	***1.00E-06***	5.49E-07	9.51E-07
300	***1.26***	***1.20***	0.21	0.9969	3.51E-07	***9.00E-07***	5.49E-07	8.51E-07	-0.06	0.9968	-1.00E-07	***4.50E-07***	5.50E-07	4.00E-07
400	***1.50***	***1.18***	0.19	0.9969	2.38E-07	***7.80E-07***	5.42E-07	7.38E-07	0.18	0.9969	2.26E-07	***7.75E-07***	5.49E-07	7.26E-07
500	***1.50***	***1.40***	0.41	0.9970	4.11E-07	***9.60E-07***	5.49E-07	9.11E-07	0.18	0.9969	1.81E-07	***7.30E-07***	5.49E-07	6.81E-07

Capsule	OC4	Specimen	67	Material	H-451									
Column	South	Length	0.9989	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.20***	***0.80***	0	0.9989					0	0.9989				
100	***1.42***	***0.95***	0.15	0.9990	7.51E-07	***1.30E-06***	5.49E-07	1.25E-06	0.22	0.9990	1.10E-06	***1.65E-06***	5.49E-07	1.60E-06
200	***1.62***	***1.09***	0.29	0.9990	7.26E-07	***1.28E-06***	5.54E-07	1.23E-06	0.42	0.9991	1.05E-06	***1.60E-06***	5.49E-07	1.55E-06
300	***1.59***	***1.25***	0.45	0.9991	7.51E-07	***1.30E-06***	5.49E-07	1.25E-06	0.39	0.9991	6.51E-07	***1.20E-06***	5.49E-07	1.15E-06
400	***1.56***	***1.39***	0.59	0.9992	7.38E-07	***1.29E-06***	5.52E-07	1.24E-06	0.36	0.9991	4.50E-07	***1.00E-06***	5.50E-07	9.50E-07
500	***1.60***	***1.60***	0.8	0.9993	8.01E-07	***1.35E-06***	5.49E-07	1.30E-06	0.4	0.9991	4.00E-07	***9.50E-07***	5.50E-07	9.00E-07

Capsule	OC4	Specimen	72	Material	H-451									
Column	North	Length	0.997	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.45***	***1.22***	0	0.9970					0	0.9970				
100	***1.92***	***1.88***	0.66	0.9973	3.31E-06	***3.85E-06***	5.40E-07	3.81E-06	0.47	0.9972	2.36E-06	***2.90E-06***	5.43E-07	2.86E-06
200	***2.35***	***2.41***	1.19	0.9976	2.98E-06	***3.52E-06***	5.36E-07	3.48E-06	0.9	0.9975	2.26E-06	***2.80E-06***	5.43E-07	2.76E-06
300	***2.72***	***2.80***	1.58	0.9978	2.64E-06	***3.18E-06***	5.39E-07	3.14E-06	1.27	0.9976	2.12E-06	***2.67E-06***	5.47E-07	2.62E-06
400	***3.18***	***3.30***	2.08	0.9980	2.61E-06	***3.15E-06***	5.42E-07	3.11E-06	1.73	0.9979	2.17E-06	***2.71E-06***	5.41E-07	2.67E-06
500	***3.77***	***3.85***	2.63	0.9983	2.64E-06	***3.18E-06***	5.42E-07	3.14E-06	2.32	0.9982	2.33E-06	***2.87E-06***	5.43E-07	2.83E-06

Capsule	OC4	Specimen	73	Material	H-451									
Column	South	Length	0.9964	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***1.12***	***1.80***	0	0.9964					0	0.9964				
100	***1.21***	***2.19***	0.39	0.9966	1.96E-06	***2.50E-06***	5.43E-07	2.46E-06	0.09	0.9964	4.52E-07	***1.00E-06***	5.48E-07	9.52E-07
200	***2.32***	***2.52***	0.72	0.9968	1.81E-06	***2.35E-06***	5.43E-07	2.31E-06	1.2	0.9970	3.01E-06	***3.55E-06***	5.39E-07	3.51E-06
300	***2.65***	***2.98***	1.18	0.9970	1.97E-06	***2.52E-06***	5.46E-07	2.47E-06	1.53	0.9972	2.56E-06	***3.10E-06***	5.41E-07	3.06E-06
400	***3.20***	***3.40***	1.6	0.9972	2.01E-06	***2.55E-06***	5.43E-07	2.51E-06	2.08	0.9974	2.61E-06	***3.15E-06***	5.41E-07	3.11E-06
500	***3.78***	***3.84***	2.04	0.9974	2.05E-06	***2.59E-06***	5.43E-07	2.55E-06	2.66	0.9977	2.67E-06	***3.21E-06***	5.40E-07	3.17E-06

Capsule	OC4	Specimen	2G	Material	Poco									
Column	West	Length	0.992	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.68***	***0.82***	0	0.9920					0	0.9920				
100	***1.58***	***1.77***	0.95	0.9925	4.79E-06	***5.30E-06***	5.12E-07	5.29E-06	0.9	0.9925	4.54E-06	***5.05E-06***	5.14E-07	5.04E-06
200	***2.53***	***2.75***	1.93	0.9930	4.86E-06	***5.38E-06***	5.16E-07	5.36E-06	1.85	0.9929	4.66E-06	***5.18E-06***	5.18E-07	5.16E-06
300	***3.49***	***3.71***	2.89	0.9934	4.86E-06	***5.37E-06***	5.14E-07	5.36E-06	2.81	0.9934	4.72E-06	***5.23E-06***	5.09E-07	5.22E-06
400	***4.52***	***4.75***	3.93	0.9940	4.95E-06	***5.46E-06***	5.08E-07	5.45E-06	3.84	0.9939	4.84E-06	***5.35E-06***	5.11E-07	5.34E-06
500	***5.60***	***5.80***	4.98	0.9945	5.02E-06	***5.53E-06***	5.10E-07	5.52E-06	4.92	0.9945	4.96E-06	***5.47E-06***	5.10E-07	5.46E-06

Capsule	OC4	Specimen	P12	Material	Poco									
Column	South	Length	0.9815	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.76***	***0.89***	0	0.9815					0	0.9815				
100	***1.60***	***1.83***	0.94	0.9820	4.79E-06	***5.25E-06***	4.61E-07	5.29E-06	0.84	0.9819	4.28E-06	***4.75E-06***	4.71E-07	4.78E-06
200	***2.70***	***2.85***	1.96	0.9825	4.99E-06	***5.45E-06***	4.58E-07	5.49E-06	1.94	0.9825	4.94E-06	***5.40E-06***	4.59E-07	5.44E-06
300	***3.80***	***3.88***	2.99	0.9830	5.08E-06	***5.53E-06***	4.53E-07	5.58E-06	3.04	0.9830	5.16E-06	***5.62E-06***	4.58E-07	5.66E-06
400	***4.88***	***4.92***	4.03	0.9835	5.13E-06	***5.59E-06***	4.58E-07	5.63E-06	4.12	0.9836	5.25E-06	***5.70E-06***	4.53E-07	5.75E-06
500	***5.98***	***6.05***	5.16	0.9841	5.26E-06	***5.71E-06***	4.53E-07	5.76E-06	5.22	0.9841	5.32E-06	***5.77E-06***	4.52E-07	5.82E-06

Capsule	OC4	Specimen	P13	Material	Poco									
Column	North	Length	0.9822	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.85***	***0.98***	0	0.9822					0	0.9822				
100	***1.60***	***1.85***	0.87	0.9826	4.43E-06	***4.90E-06***	4.71E-07	4.93E-06	0.75	0.9826	3.82E-06	***4.30E-06***	4.82E-07	4.32E-06
200	***2.60***	***2.78***	1.8	0.9831	4.58E-06	***5.05E-06***	4.68E-07	5.08E-06	1.75	0.9831	4.45E-06	***4.93E-06***	4.76E-07	4.95E-06
300	***3.60***	***3.72***	2.74	0.9836	4.65E-06	***5.12E-06***	4.71E-07	5.15E-06	2.75	0.9836	4.67E-06	***5.13E-06***	4.64E-07	5.17E-06
400	***4.60***	***4.69***	3.71	0.9841	4.72E-06	***5.18E-06***	4.58E-07	5.22E-06	3.75	0.9841	4.77E-06	***5.24E-06***	4.68E-07	5.27E-06
500	***5.57***	***5.65***	4.67	0.9845	4.75E-06	***5.22E-06***	4.65E-07	5.25E-06	4.72	0.9846	4.81E-06	***5.27E-06***	4.64E-07	5.31E-06

Capsule	OC4	Specimen	P22	Material	Poco									
Column	South	Length	0.9799	Scale	1"	5.00E-04								
Temperature (°C)	Up	Down	Delta Down	Down length	CTE	CTEK	Delta CTEK	CTE adjusted	Delta Up	Up length	CTE	CTEK	Delta CTEK	CTE adjusted
0	***0.95***	***1.22***	0	0.9799					0	0.9799				
100	***1.87***	***2.06***	0.84	0.9803	4.29E-06	***4.75E-06***	4.64E-07	4.79E-06	0.92	0.9804	4.69E-06	***5.15E-06***	4.56E-07	5.19E-06
200	***2.98***	***2.98***	1.76	0.9808	4.49E-06	***4.95E-06***	4.60E-07	4.99E-06	2.03	0.9809	5.18E-06	***5.63E-06***	4.51E-07	5.68E-06
300	***3.96***	***3.95***	2.73	0.9813	4.64E-06	***5.10E-06***	4.57E-07	5.14E-06	3.01	0.9814	5.12E-06	***5.57E-06***	4.50E-07	5.62E-06
400	***4.98***	***4.98***	3.76	0.9818	4.80E-06	***5.25E-06***	4.54E-07	5.30E-06	4.03	0.9819	5.14E-06	***5.59E-06***	4.49E-07	5.64E-06
500	***5.98***	***6.02***	4.8	0.9823	4.90E-06	***5.35E-06***	4.52E-07	5.40E-06	5.03	0.9824	5.13E-06	***5.58E-06***	4.47E-07	5.63E-06

Appendix C Creep Corrections

KFA Correction to Creep Data

The following correction to creep data was presented to ORNL during a German/US creep programme exchange (ref X).

1	**Available Data**	
1.1	Measured sample length at R.T. without load	
1.1.1	Reference Sample length	$I^R(\gamma,\theta_{rt},0)$
1.1.2	Reference dimensional strain	$\varepsilon^R(\gamma,\theta_{rt},0)=\frac{I^R(\gamma,\theta_{rt},0)}{I^R(0,\theta_{rt},0)}-1$
1.1.3	Stressed Sample length	$I^S(\gamma,\theta_{rt},0)$
1.1.4	Stressed dimensional strain	$\varepsilon^S(\gamma,\theta_{rt},0)=\frac{I^S(\gamma,\theta_{rt},0)}{I^S(0,\theta_{rt},0)}-1$
1.2	Creep Strain	$\varepsilon_c(\gamma,\theta_{rt},0)=\frac{I^S(\gamma,\theta_{rt},0)}{I^S(0,\theta_{rt},0)}-\frac{I^R(\gamma,\theta_{rt},0)}{I^R(0,\theta_{rt},0)}$
2	**Wanted Data**	
	Length values at Temperature, T under load, σ	
2.1	**Input data**	
2.1.1	CTE (what cte value assumed – mean 20-T?)	$\alpha(0,\theta_T,0)$
		$\alpha(\gamma,\theta_T,0)$
2.1.2	(n.b. factorial change in CTE assumed)	$a(\gamma)=\frac{\alpha(\gamma,\theta_T,0)}{\alpha(0,\theta_T,0)}$
2.1.3	CTE change due to creep (comp or tensile), ε_c (%)	$\alpha_c(\gamma,\theta_T,\sigma)=\alpha(\gamma,\theta_T,0)\left(1\pm 0.15\varepsilon_c(\gamma,\theta_{rt},0)\right)$

2.1.4 Young's Modulus (assumes no Temperature dependence of E) $E(0,\theta_T,0)$

$E(\gamma,\theta_T,0)$

2.1.5 (n.b. no effect of creep strain assumed for E) $e(\gamma)=\dfrac{E(\gamma,\theta_T,0)}{E(0,\theta_T,0)}$

2.2 **Strain data corrected for creep conditions**

2.2.1 Modified Reference Length at Temperature $I^R(0,\theta_T,0)=\left[1+\alpha(0)\Delta T\right]\left(I^R(0,\theta_{rt},0)\right)$

$I^R(\gamma,\theta_T,0)=\left[1+a(\gamma)\alpha(0)\Delta T\right]\left(I^R(\gamma,\theta_{rt},0)\right)$

2.2.2 Modified Reference dimensional strain $\varepsilon^R(\gamma,\theta_T,0)+1=\left[\dfrac{1+a(\gamma)\alpha(0)\Delta T}{1+\alpha(0)\Delta T}\right]\left(\dfrac{I^R(\gamma,\theta_{rt},0)}{I^R(0,\theta_{rt},0)}\right)$

2.2.3 Modified Stressed Length at Temperature $I^S(0,\theta_T,\sigma)=\left[1+\dfrac{\sigma}{E(0,\theta_T,0)}\right]\left[1+\alpha(0)\Delta T\right]\left(I^S(0,\theta_{rt},0)\right)$

$I^S(\gamma,\theta_T,\sigma)=\left[1+\dfrac{\sigma}{e(\gamma)E(0,\theta_T,0)}\right]\left[1+a(\gamma)\alpha_c(\gamma)\Delta T\right]\left(I^S(\gamma,\theta_{rt},0)\right)$

2.2.4 Modified Stressed dimensional strain $\varepsilon^S(\gamma,\theta_T,\sigma)+1=\left[\dfrac{\left(1+\dfrac{\sigma}{e(\gamma)E(0,\theta_T,0)}\right)\left(1+a(\gamma)\alpha_c(\gamma)\Delta T\right)}{\left(1+\dfrac{\sigma}{E(0,\theta_T,0)}\right)\left(1+\alpha(0)\Delta T\right)}\right]\left(\dfrac{I^S(\gamma,\theta_{rt},0)}{I^S(0,\theta_{rt},0)}\right)$

2.2.5 Modified Creep strain $\varepsilon_c(\gamma,\theta_T,\sigma)=\varepsilon^S(\gamma,\theta_T,\sigma)-\varepsilon^R(\gamma,\theta_T,0)$

UK correction to creep data

Within the UK methodology (Ref X), the irradiation induced creep strain is defined as the additional length change arising from an applied stress as measured at temperature in the stressed condition and the measured dimensions are corrected for difference in:

- Elastic recovery upon load removal;
- Change of length upon cooling from the irradiation temperature.

The method applied is as follows

If:

l_0 is the measured length of the specimen unirradiated at room temperature

l is the measured length of the specimen irradiated at room temperature

Then, assuming a mean irradiation temperature of T

$l_0^{'} = l_0\left(1+\alpha_0(T)+\sigma/E_0\right)$ is the length of specimen at the start of irradiation

$l^{'} = l\left(1+\alpha_i(T)+\sigma/E_i\right)$ is the length of specimen at the end of irradiation

The in-reactor strain is then given by:

$$\left(\frac{L^{'}-L_0^{'}}{L_0^{'}}\right)=\left(\frac{L-L_0}{L_0}\right)+(\alpha_i-\alpha_0)(T)-\left(\frac{\sigma}{E_0}\right)\left[1-\frac{E_0}{E_i}\right]$$

For the unstressed control specimen:

$$\left(\frac{l^{'}-l_0^{'}}{l_0^{'}}\right)=\left(\frac{l-l_0}{l_0}\right)+(\alpha_c-\alpha_0)(T)$$

Therefore, creep strain should be defined as:

$$\varepsilon_c=\left(\frac{L^{'}-L_0^{'}}{L_0^{'}}\right)-\left(\frac{l^{'}-l_0^{'}}{l_0^{'}}\right)=\left(\frac{L-L_0}{L_0}\right)-\left(\frac{l-l_0}{l_0}\right)+(\alpha_i-\alpha_c)(T)-\left(\frac{\sigma}{E_0}\right)\left[1-\frac{E_0}{E_i}\right]$$

Discussion

KFA have used the length change induced by thermal strain to be multiplicative to the length change induced by elastic strain i.e. the strain is sequential. The UK methodology assumes that both the load and thermal strain apply to the length measured at room temperature. For the OC-Series, the UK methodology applies a larger correction than the KFA methodology.

Whilst the corrections are small, of the order of 0.1% on creep strain, there is a significant difference between the two methodologies, which warrants further investigation.

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