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Cumulative Results of Irradiation Induced Creep of Material IG-110 - Prepared for Toyo Tanso Co., Ltd.

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July 2018

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

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Irradiation effects study of Toyo Tanso HTGR Graphite, Part II: Irradiation and Post-irradiation examination
DOE Project No. NFE-10-02974

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1. INTRODUCTION

This letter report provides additional results from the irradiation creep section of the ORNL report number ORNL/TM-2017/705 [1]. The results presented include the medium and high fluence dimensional change of stressed and unstressed specimens.

2. RESULTS

The post-irradiation examination of the first, of three irradiation-induced creep experiments, was completed, and the preliminary results are summarized in this section. The creep experiment had two distinct temperature regions: 300°C, and 600°C. The applied compressive stress was nominally 13.5 MPa. Unlike the rabbits, the design of these experiments was very complex. The final average specimen temperatures achieved for these regions were 243°C and 497°C, respectively. The results of the dimensional change of the stressed specimens are shown in Figure 1. The individual specimen results are listed in Table 1.

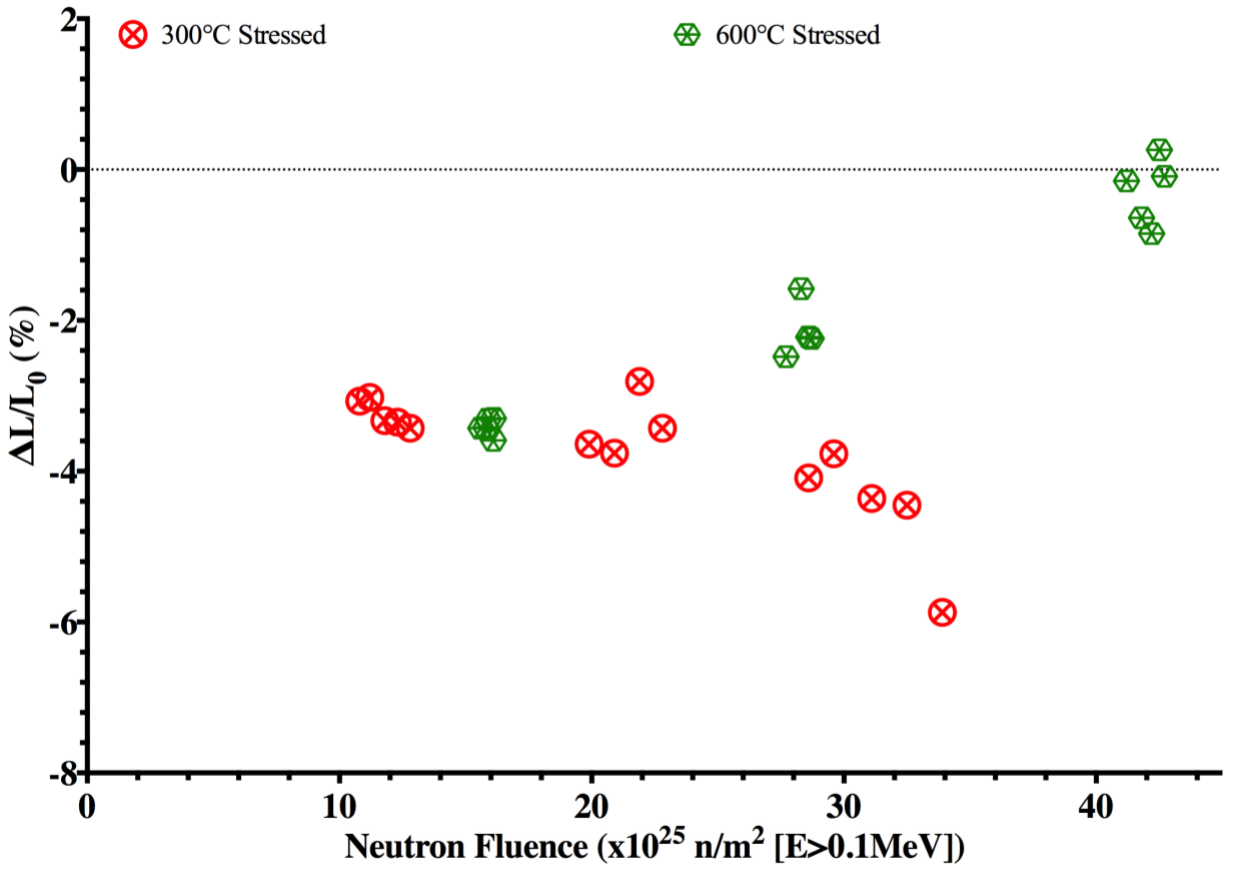

Figure 1. Dimensional strain of stressed specimens in first creep experiment.

Table 1. Individual specimen results.

ID	Material	Sample Type	Orien.	Creep	Design Temp. (°C)	Measured Temp. (°C)	Neutron Fluence ($x10^{25}$ n/m^2 [E>0.1 MeV])	Length Change ($\Delta L/L_0$)
T14A38	IG110	CRP	AX	Stressed	300	243	10.8	-3.07%
T14A37	IG110	CRP	AX	Stressed	300	243	11.2	-3.02%
T13A33	IG110	CRS	AX	Stressed	300	243	11.8	-3.33%
T14A36	IG110	CRP	AX	Stressed	300	244	12.3	-3.35%
T14A35	IG110	CRP	AX	Stressed	300	253	12.8	-3.43%
T14A49	IG110	CRP	AX	Stressed	300	226	19.9	-3.64%
T13A21	IG110	CRS	AX	Stressed	300	226	20.9	-3.76%
T14A48	IG110	CRP	AX	Stressed	300	227	21.9	-2.81%
T14A47	IG110	CRP	AX	Stressed	300	235	22.8	-3.43%
T14A74	IG110	CRP	AX	Stressed	300	240	28.6	-4.09%
T14A73	IG110	CRP	AX	Stressed	300	241	29.6	-3.77%
T13A27	IG110	CRS	AX	Stressed	300	241	31.1	-4.36%
T14A62	IG110	CRP	AX	Stressed	300	242	32.5	-4.45%
T14A34	IG110	CRP	AX	Stressed	300	251	33.9	-5.87%
T14A40	IG110	CRP	AX	Unstressed	300	238	12.2	1.28%
T14A39	IG110	CRP	AX	Unstressed	300	239	12.6	1.69%
T13A34	IG110	CRS	AX	Unstressed	300	245	13.0	1.05%
T14A55	IG110	CRP	AX	Unstressed	300	240	21.7	1.39%
T14A54	IG110	CRP	AX	Unstressed	300	241	22.4	1.43%
T13A67	IG110	CRS	AX	Unstressed	300	248	23.1	0.47%
T14A63	IG110	CRP	AX	Unstressed	300	256	32.3	2.52%
T14A64	IG110	CRP	AX	Unstressed	300	257	33.4	2.57%
T13A28	IG110	CRS	AX	Unstressed	300	264	34.4	1.93%
T14A72	IG110	CRP	AX	Stressed	600	496	15.6	-3.43%
T14A71	IG110	CRP	AX	Stressed	600	500	15.8	-3.42%
T13A31	IG110	CRS	AX	Stressed	600	501	15.9	-3.31%
T14A70	IG110	CRP	AX	Stressed	600	502	16.1	-3.59%
T14A69	IG110	CRP	AX	Stressed	600	505	16.1	-3.30%
T14A45	IG110	CRP	AX	Stressed	600	515	27.7	-2.48%
T13A19	IG110	CRS	AX	Stressed	600	521	28.3	-1.58%
T14A01	IG110	CRP	AX	Stressed	600	522	28.6	-2.22%
T14A00	IG110	CRP	AX	Stressed	600	524	28.7	-2.24%
T14A60	IG110	CRP	AX	Stressed	600	481	41.2	-0.15%
T14A53	IG110	CRP	AX	Stressed	600	485	41.8	-0.64%
T13A25	IG110	CRS	AX	Stressed	600	486	42.2	-0.85%
T14A52	IG110	CRP	AX	Stressed	600	487	42.5	0.26%
T14A51	IG110	CRP	AX	Stressed	600	489	42.7	-0.09%
T14A44	IG110	CRP	AX	Unstressed	600	488	16.0	-1.84%
T14A43	IG110	CRP	AX	Unstressed	600	489	16.1	-1.82%
T13A36	IG110	CRS	AX	Unstressed	600	487	16.1	-1.91%
T14A58	IG110	CRP	AX	Unstressed	600	508	28.5	0.28%
T14A59	IG110	CRP	AX	Unstressed	600	509	28.6	-0.13%
T13A24	IG110	CRS	AX	Unstressed	600	506	28.7	-1.07%
T14A67	IG110	CRP	AX	Unstressed	600	478	42.3	3.67%
T14A68	IG110	CRP	AX	Unstressed	600	479	42.6	4.17%
T13A30	IG110	CRS	AX	Unstressed	600	477	42.7	4.39%

3. REFERENCES

1. Campbell, A.A. and Y. Katoh, "Report on Effects of Irradiation on Material IG-110 -Prepared for Toyo Tanso Co., Ltd.", ORNL/TM-2017/705, (2017),

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