

Additional Iodine Capture of the Modified Silver Aerogel and Technical Review



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September 2019

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Isotope and Fuel Cycle Technology Division

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This letter report documents the completion of the Off-Gas Sigma Team–Oak Ridge National Laboratory (ORNL) work package (FT-19OR03010702) Level 4 milestone M4FT-19OR0301070218 “*Conduct additional tests and provide technical review support for reengineered silver-functionalized aerogel.*” This milestone was completed on time.

The report associated with ORNL’s Level 3 milestone M3FT-19OR030017025 “*Complete extended duration (3 month) vessel off gas (VOG) test using reengineered silver functionalized aerogel*” was transmitted to Pacific Northwest National Laboratory (PNNL). A teleconference was held on August 7, 2019, between ORNL and PNNL to review the report and its associated findings. One of the most notable findings was that bed compaction was observed with both the original and reengineered silver-functionalized aerogel.

During the teleconference, ORNL informed PNNL that recent test results showed that exposure to 2% NO₂ at 150°C caused physical degradation of the original aerogel material, reflected by a loss in weight during exposure to the NO₂-bearing gas stream. Visual inspection indicates that the material was degrading to fines that were carried by the gas stream. A path forward was established, and PNNL requested that ORNL test the reengineered aerogel material under similar conditions to assess whether NO₂-related degradation also occurred with the reengineered silver-functionalized aerogel. This test was completed and the results (Figure 1) show that the reengineered material does not experience NO₂-related degradation under the conditions tested.

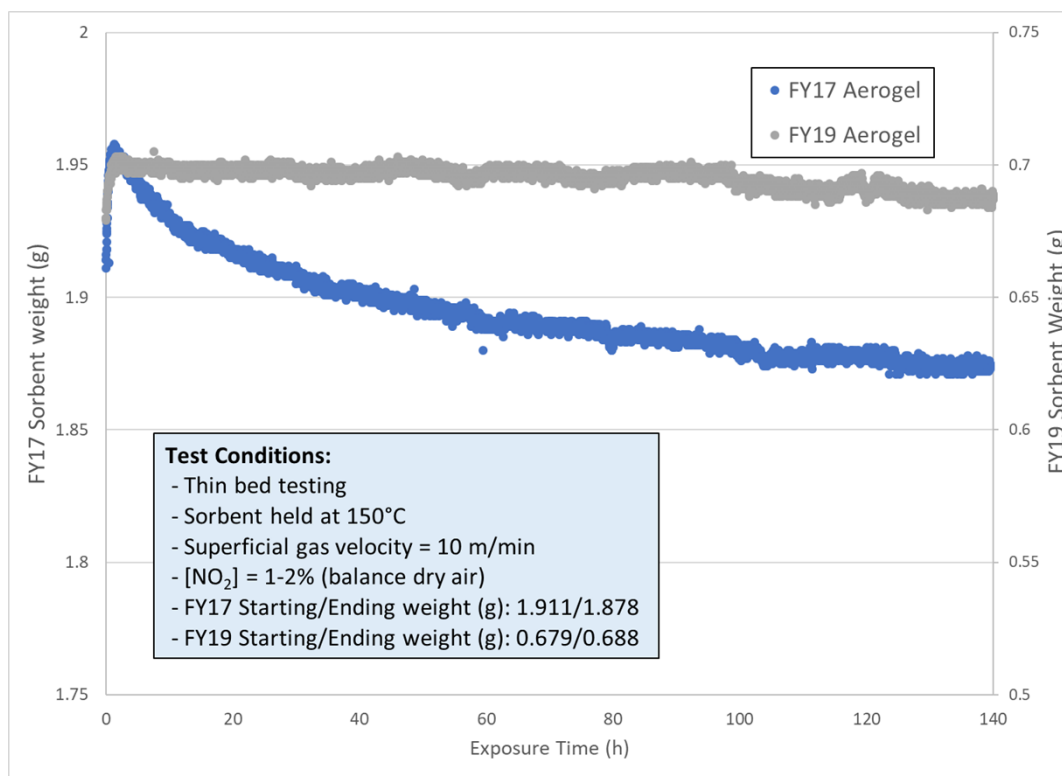


Figure 1. NO₂ exposure of silver-functionalized silica aerogel.

ORNL has shipped NO₂-exposed original and reengineered silver-functionalized aerogel to PNNL for further characterization. ORNL also provided four additional samples of fiscal year 2017 material that demonstrated bed compaction during VOG testing. PNNL may use these samples to assess the fundamental cause of bed compaction observed in both the original and reengineered silver-functionalized aerogel material. Table 1 provides descriptions of each of the samples sent to PNNL. The samples

generated in fiscal year 2017 are described more fully in the report entitled, “Performance of Silver-Exchanged Mordenite and Silver-Functionalized Silica-Aerogel Under Vessel Off-gas Conditions” (NTRD-MRWFD-2017-000034).

Table 1. Description of samples sent to PNNL

Sample	Description
FY19-007	FY17 Aerogel, exposed to NO ₂ (no iodine present)
FY19-008	FY19 Aerogel, exposed to NO ₂ (no iodine present)
VOG17-T4-Q4	FY17 Aerogel used in VOG testing (iodine present)
VOG17-T7-Q4	FY17 Aerogel used in VOG testing (iodine present)
VOG17-T4-Bed3	FY17 Aerogel used in VOG testing (no iodine present)
VOG17-T7-Bed3	FY17 Aerogel used in VOG testing (no iodine present)

Upon request, PNNL did not indicate that a technical review of its associated milestone report was needed at this time. ORNL is available to complete this activity in the future.