

**Contract No:**

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## SR17024– Characterization and Tritium Aging of LANA.85 for Regenerative Testing (SRNL-STI-2019-00615)

### Facility Need

LANA.85 has been suggested for use in both the Four-Inch Short Hydride (FISH) as well as the Forced Atmosphere Cooled Electrically heated (FACE) bed designs that may be implemented in the Tritium Facilities. LANA.85 has a lower plateau pressure than LANA.75 at a given temperature and composition. Though data is limited, previous tritium aging studies initiated on LANA.85 suggest that radiolytic decay of tritium to He-3 within the metal matrix causes performance degradation similar to LANA.75. Tritium aging studies on LANA.85 are needed to characterize behavior on a small scale before implementation occurs on a large scale.

### Potential Benefits

- |   |   |  |   |
|---|---|--|---|
| <input type="checkbox"/> Cost Reduction               | <input type="checkbox"/> Defect Reduction                 | <input type="checkbox"/> Error Reduction                 | <input checked="" type="checkbox"/> Mission Diversification |
| <input checked="" type="checkbox"/> Mission Viability | <input checked="" type="checkbox"/> Obsolescence Solution | <input checked="" type="checkbox"/> Process Optimization | <input checked="" type="checkbox"/> Safety                  |

### Project Summary

Characterization and tritium-aging of LANA.85 for Regeneration Testing is a multi-year project.

Objectives included: fabrication of an inherently safe test cell, characterization of the sample via deuterium and tritium isotherms, and initiation of tritium aging of the sample.

During FY19, baseline tritium desorption isotherms were collected at 100, 125, and 150 °C on the LANA85 sample. This was the same sample used for deuterium testing in FY18. Following testing, the sample was reloaded with tritium for future aging studies. Tritium test results are shown on the next page.

Tritium decay within the hydride causes changes in the isotherm plateau (depression and/or slope), reduces the reversible capacity of the bed, and eventually leads to He-3 saturation of the metal. These effects are collectively considered ‘tritium aging’ of the hydride. Isotherms will be measured annually to monitor performance degradation.

If future testing demonstrates that the LANA.85 ages as anticipated, and LANA.85 is selected for use in FACE or FISH beds, the sample may be used for regeneration testing. The conditions for

regeneration testing will depend on test results obtained under a different work scope studying LANA.75 regeneration. The primary advantage of aging the LANA.85 sample in a regenerable test cell is the

### SR17024

#### Status

Complete. Started FY17

#### Technology Readiness Level

Start of FY19: 4  
End-of-FY19 Forecast: 4  
End-of-FY19 Actual: 4

#### Financial

FY19 Project Cost: \$70K  
Cumulative Total Project Cost: \$320K

#### Credits

Principal Investigators: Greg Staack,  
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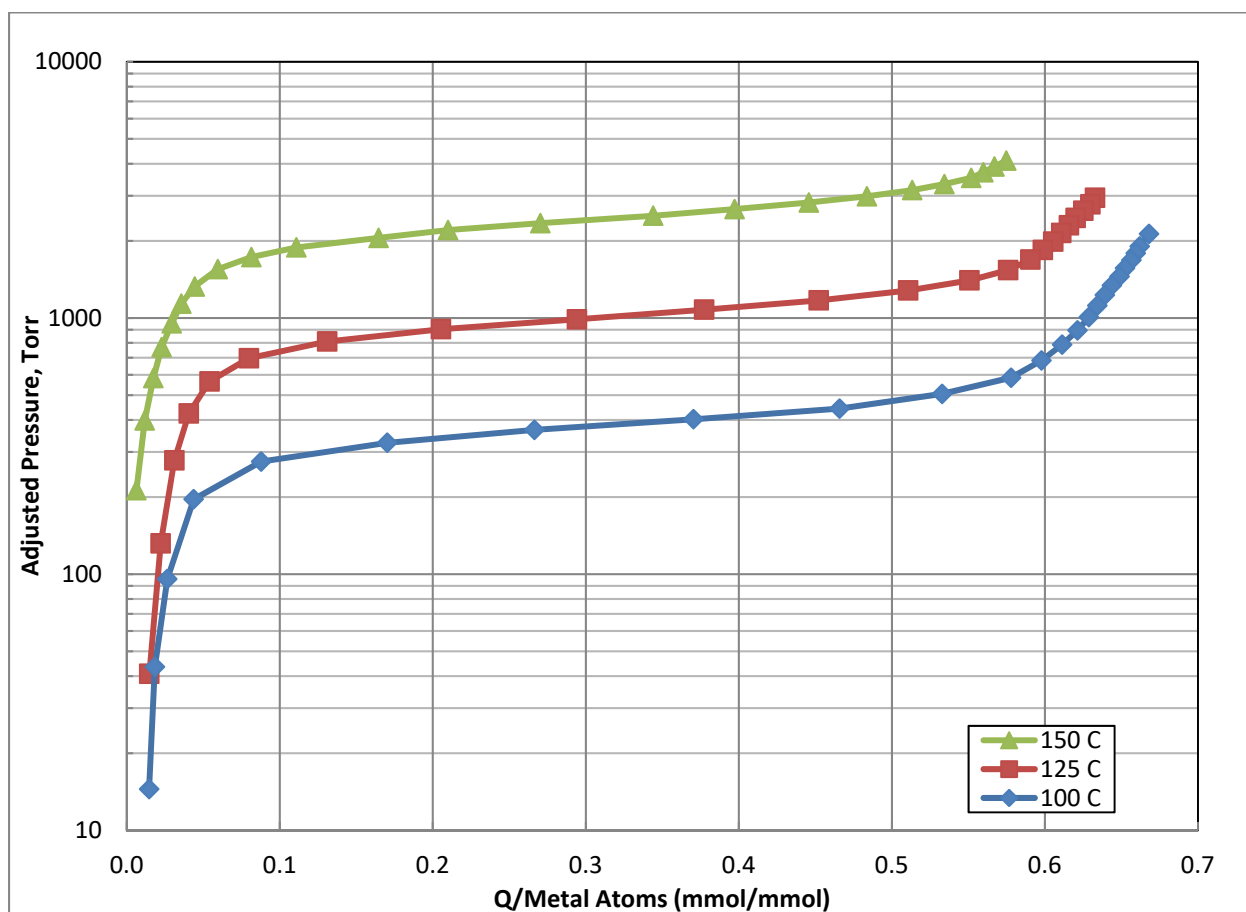


Figure 1. Tritium Desorption Isotherms on LANA.85

ability to track isotherm performance and perform regeneration testing without the need to perturb the hydride by deliberately oxidizing it and transferring it to another test cell. While regenerative testing will not take place for several years, it is important to initiate tritium aging in an inherently safe test cell now. A well-aged sample will provide the clearest indication of the potential degree of restoration that may occur in a full-scale hydride bed. If tritium exposure has not had sufficient time to degrade performance, observation of any improvements will be difficult to quantify.

### Milestones/Findings/Accomplishments

Project Milestone	Expected End	Actual End
Fabricate new inherently safe test cell valve assembly	3/18	3/18
Collect deuterium isotherms on virgin LANA.85	6/18	6/18
Collect tritium isotherms on virgin LANA.85	8/19	6/19
Submit year-end report/project summary	9/18	9/18

### Future Work

- Monitor tritium aging over several years
- Perform regeneration testing when the sample is sufficiently aged