Sample Environment at VULCAN

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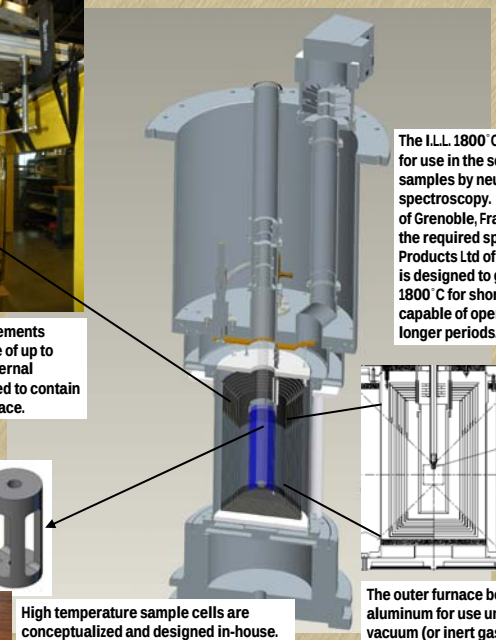
NEUTRON SCIENCES

Abstract: The SNS Sample Environment team has been purchasing, designing, modifying, and testing equipment to meet the specific needs of unique sample environment layouts like that of VULCAN. Equipment such as an ILL vanadium furnace and high temperature sample containers made of materials like titanium and vanadium can cater directly to user needs. During the equipment design phase special parameters are taken into account. For instance, sample shape and size, beam characteristics, and logistics within the VULCAN instrument layout. Therefore, sample environment staff work intimately with the instrument team to create a quality neutron scattering experience for VULCAN users. This interaction is further cultivated through user feedback and collaboration on small-scale/large-impact projects, by way of the Sample Environment Steering Committee.

I.L.L. 1800˚C Furnace

The niobium heating elements generate a temperature of up to 1800˚C. A number of internal niobium shields are used to contain the heat within the furnace.



The I.L.L. 1800˚C Furnace is a proven design for use in the scientific analysis of material samples by neutron diffraction or spectroscopy. It has been designed by I.L.L. of Grenoble, France and is manufactured to the required specifications by AS Scientific Products Ltd of Abingdon, U.K. The furnace is designed to generate temperatures up to 1800˚C for short periods of time and is capable of operation at 1600˚C for much longer periods.

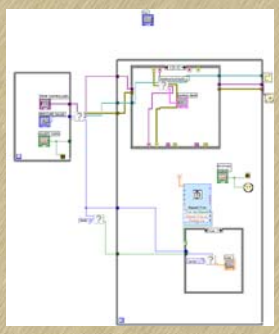
The outer furnace body is made of aluminum for use under high vacuum (or inert gas atmosphere). Niobium and aluminum window sections are designed to allow neutron access 360˚ in the scattering plane and +/- 20˚ out of the scattering plane.

High temperature sample cells are conceptualized and designed in-house. These cells are for high temperature applications (1400˚C). Both cells are made of Vanadium. One cell stabilizes the sample with a screw, the other suspends samples with a wire.

Remote Operation

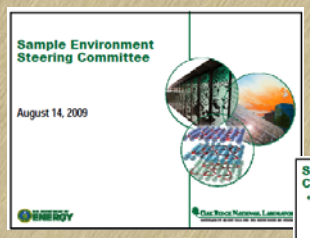
An equipment software interface was designed and tested in-house using LabVIEW.

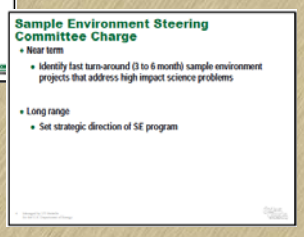
Furnace VI front panel



Furnace VI block diagram

Sample Environment Steering Committee





Many new capabilities will be developed through small scale R&D projects led by scientific staff or sample environment (SE) team members. Mini-proposals will be reviewed by the SE steering committee. Projects currently underway that may impact science at VULCAN:

- An upgrade from our current capability of a 1000 bar Titanium Zirconium (TiZr) null scattering pressure cell to a redesigned 4000 bar TiZr cell.

Current TiZr cell rated for 1000 bar

- A gas flow furnace cell for in situ studies using an automated gas handling system like the already proven PAGES.

Portable Automated Gas Environment System (PAGES)

- Large scale project...

A 3D conceptual sketch of TGA furnace insert

- A ThermoGravimetrical Analysis (TGA) furnace Insert for in situ studies of fuel cell materials.

Contributors
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3D ILL Furnace Graphic: Chris Wenzel
3D TGA Insert Graphic: DeAundra Woods
Remote Furnace LabVIEW VI: John Wenzel
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