

COMMISSIONING RESULTS AND NEW SCIENTIFIC OPPORTUNITIES AT VULCAN - the SNS MATERIALS SCIENCE AND ENGINEERING DIFFRACTOMETER

Ke An¹, Xun-Li Wang¹, Alexandru D. Stoica¹, Harley Skorpenske¹, Dong Ma¹, Thomas M. Holden², Peter K. Liaw³, Hahn Choo³, and Camden R. Hubbard¹

¹ Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA, kean@ornl.gov

² Northern Stress Technology, Deep River, Canada

³ Department of Materials Science and Engineering, University of Tennessee, Knoxville, Tennessee, USA

On Friday June 26, 2009, VULCAN shutter was opened for the first time. VULCAN initial measurements at 400 kw indicated a very impressive flux on sample. The commission results including stress/stain mapping, in-situ loading, phase transition and texture evolution at elevated temperature and exploration of new type of experiments will be reported. Once the instrument is fully characterized, VULCAN will be well on its way to serve users as soon as in run cycle of September 2010. Unique capabilities of VULCAN include a focused neutron beam with flexible intensity resolution optimization, a load-frame capable of multi-axial loading, and the ability for simultaneous small angle neutron scattering (SANS). Initial tests show that the interchangeable guide-collimator system is working well. High resolution mode provides 0.2% resolution and high intensity mode enhances VULCAN's capability for kinetic studies. The multi-axial VULCAN load-frame will be commissioned in May 2010. The use of opposing actuators ensures that the measurement locations are fixed in space and this opens up new possibilities in terms of multi-probe characterization. A SANS detector has been allocated to VULCAN, which will be installed in 2010.

The scientific drivers for VULCAN were laid out nearly 10 years ago. From the outset, it was recognized that as a state-of-the-art instrument, VULCAN should target new experiments that cannot be readily done with existing instruments. In-situ studies of time-dependent or transient behaviors were identified early on as one of the new scientific opportunities where VULCAN is expected to make an impact. In this case, the SNS event-based data acquisition system will prove to be particularly useful. An asynchronous data acquisition strategy is being developed. The ultimate time resolution with this measurement technology is expected to be ~10 μ s. These and other new research opportunities will be explored.