

**THE NEW ENGINEERING NEUTRON DIFFRACTION INSTRUMENT AT
HFIR AND ITS APPLICATION TO STUDIES OF THE BEHAVIOR OF
STRUCTURAL MATERIALS**

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The High Flux Isotope Reactor, HFIR, at Oak Ridge National Laboratory is the highest flux reactor-based source of neutrons for materials research in the United States. Thermal and cold neutrons produced by the HFIR are used for research in physics, chemistry, materials science, engineering and biology. One of the new scattering instruments at HFIR is the 2nd generation Neutron Residual Stress Facility, NRSF2, for high spatial resolution mapping of residual stresses throughout the thickness of components and for measurement of material behavior during in situ and/or real-time processes.

NRSF2 components include: a two Si wafer, doubly bent focusing monochromators; a large capacity XYZ sample positioning system with two different Z-stages; incident and diffracted beam collimators with slits that define the gage volume ranging from 0.3 mm to 20 mm; seven position sensitive detectors which increase data count rates; and LabView data collection and data analysis programs. Sample environment systems include a 5000 lb load frame for in situ tensile/compression experiments, a 2-circle Huber sample orienter, several furnaces and a unique induction heater insert for use with a 5T superconducting magnet. Tests show an increase of nearly 100 fold faster data collection over the older instrument. Selected research highlights will be presented that show the breadth of external user projects recently conducted at NRSF2.