

## W0210

**Versatile USAXS (Bonse-Hart) Facility for Advanced Materials Research.** Jan Ilavsky, Pete Jemian, Andrew J. Allen, Gabrielle G. Long, Purdue Univ., UNICAT, Bldg. 438E, Argonne National Laboratory, Argonne, IL 60439.

A Bonse-Hart USAXS facility developed by NIST at UNICAT 33ID beamline at Advanced Photon Source, ANL, Argonne, IL, is a world-class resource for advanced materials research. The facility consists of a Bonse-Hart-type camera, fully-automated instrument control, data reduction, and evaluation software packages, and dedicated staff to support users. Instrument performance parameters include: undulator X-ray source with  $\sim 10^{13}$  photons/sec at 10keV, 7 – 19 keV energy range,  $0.0001 \text{ \AA}^{-1}$  -  $1 \text{ \AA}^{-1}$  Q-range, 9 decade intensity range, primary (standardless) absolute intensity calibration, fluorescence rejection in the scattered beam, beam sizes from  $1.2 \text{ mm}^2$  down to  $0.04 \text{ mm}^2$  with a 1-D spatial resolution down to  $20 \text{ \mu m}$ . Instrument capabilities encompass: semi-automated data reduction, analysis using state-of-the-art structure factors and models, anomalous SAXS, and USAXS-imaging capabilities. Both 1-D collimated (slit smeared) and 2-D collimated configurations are routinely available.

Number of problems studied at this instrument include characterization of the formation of nanoparticles within a flame, sintering-resistance in advanced thermal coatings, gradient microstructures in fuel cell layers, nano-particulate agglomeration and assembly, and dislocation structures in aluminum. Polymer studies include hierarchical structures, in-situ and ex-situ deformation, nano-composites, and carbon nanotube fillers. Environmental science studies include diesel soot formation and soil structure studies.

The presentation includes instrumental design description, description of data reduction and data evaluation software packages and examples of scientific outputs.