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Investigating the micromechanics of polycrystalline materials using high-energy X-ray diffraction

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ABSTRACT

Quantifying the state of materials and understanding their micromechanical behavior are ever more important for designing and building efficient, high-performance machines. High-energy synchrotron radiation is an attractive nondestructive tool for investigating the state and the micromechanical behavior of polycrystalline structural alloys. In this discussion, two high energy X-ray experimental techniques that are available at Sector 1 of the Advanced Photon Source will be presented. Wide angle X-ray scattering (WAXS) technique is used to measure orientation dependent quantities such as crystallographic texture or stress orientation distribution function. High-energy diffraction microscopy (HEDM) technique is a suite of experiments where orientation, strain, and position of individual grains in a polycrystalline sample can be measured.