

Measuring and modeling deformation partitioning in titanium alloys
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Body centered cubic (BCC) titanium alloys have been developed for structural applications with specific strength restrictions. The large strength to stiffness ratio makes BCC titanium such as β 21S a particularly attractive material for in-situ mechanical loading / x-ray diffraction studies. This talk describes a project with a dual thrust: to conduct in-situ deformation experiments at the Advanced Photon Source (APS) beamline 1-IDC and to simulate the experiments using polycrystal elasto-viscoplastic model within a finite element formulation. The lattice strain tensor in various crystals measured directly in the experiments is compared to the simulation. The first step is determination of the single crystal elastic moduli of the β 21S. The anisotropic ratio is of primary interest and plays a strong role in strain partitioning as the deformation transitions from elastic to elastic-plastic. Recent experiments measuring the spatially resolved stress state within individual crystals is described. This research project is supported by the Office of Naval Research (ONR) under contract numbers N00014-05-1-0505, Dr. Julie Christodoulou, Grant Officer.