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**POLYCHROMATIC X-RAY MICROBEAM TECHNIQUES FOR MICRON RESOLUTION
3-D STUDIES OF DEFORMATION IN METALS**

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POLYCHROMATIC X-RAY MICROBEAM TECHNIQUES FOR MICRON RESOLUTION 3-D STUDIES OF DEFORMATION IN METALS

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The ultra-high brilliance of 3rd generation synchrotron sources, together with the development of high-resolution x-ray focusing optics, automated white-beam diffraction software, and newly developed depth-profiling techniques have made 3-D x-ray structural microscopy possible with micron resolution in all directions. Micron resolution 3-D x-ray structural microscopy (XSM) provides non-destructive access to the orientation, phase, shape, and stress/strain of crystal microstructure in both single and polycrystalline materials in unstrained and deformed materials. The key elements of the technique will be described and methods for obtaining micron depth resolution will be discussed.

Application of the technique to mesoscale investigations of elastic and plastic deformation will be illustrated through measurements on Si, Cu, and Al under deformed and unstrained conditions as performed on the microbeam x-ray facility developed on the MHATT-CAT beamline at the Advanced Photon Source (APS). The complementarity of x-ray microbeam techniques to electron microscopy and electron backscattering, and their relation to computer simulation and multi-scale modeling of mesoscale microstructure and evolution will be discussed.

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