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White and Monochromatic X-Ray Microbeam Investigations of Materials Microstructure and Tri-Axial Stress/Strain on Mesoscopic Length Scales

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WHITE AND MONOCHROMATIC X-RAY MICROBEAM INVESTIGATIONS OF MATERIALS MICROSTRUCTURE AND TRI-AXIAL STRESS/STRAIN ON MESOSCOPIC LENGTH SCALES

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The availability of high brilliance synchrotron x-ray sources and new high-precision x-ray focusing optics have made possible revolutionary advances in microbeam x-ray capabilities for the investigation of materials on mesoscopic length scales of tenths of microns to hundreds of microns. This presentation will discuss the generation of submicron resolution x-ray microbeams using Kirkpatrick-Baez mirrors and the application of interchangeable polychromatic/monochromatic microbeams in connection with interactive Laue diffraction analysis software for the investigation of the orientation, spatial distribution, and stress/strain in 2-D and 3-D polycrystalline and deformed materials. Examples will include investigation of inter- and intra-granular strain and orientation in aluminum interconnect wires, the deformation microstructure under nanoindents in copper and plane-strain deformed aluminum, and epitaxy in multi-layer metal-oxide films. Techniques used to obtain submicron beams, the methods used in performing and analyzing submicron resolution diffraction measurements, and the techniques used to obtain 3-D spatial resolution will be discussed.

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Invited Presentation

Session organized by Cev Noyan and Gene Ice on Microbeam Techniques

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