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DEFORMATION MICROSTRUCTURE UNDER NANOINDENTS IN CU STUDIED USING X-RAY MICROBEAMS

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The microstructure and local lattice orientations associated with deformation under nanoindents in Cu have been investigated with submicron resolution using 3D x-ray structural microscopy. Depth profiling of diffracted x-ray patterns provides nondestructive, submicron resolution measurements of the local orientations, rotation axes, dislocation tensors, and geometrically necessary dislocations associated with plastic deformation under indents. Measurements have been made on Berkovich, spherical, and conical nanoindents with a range of forces up to 200 mN. The deformation induced rotations and rotation axes generated by spherical, conical, and Berkovich indents will be compared quantitatively. Measurements of geometrically necessary dislocation distributions will be presented and related to the understanding of the deformation process. *Research supported by the DOE Office of Science Division of Materials Sciences under contract with ORNL, managed by with UT-Battelle, LLC; UNI-CAT is supported by ORNL, UIUC-MRL, NIST, and UOP Res., Inc.; The APS is supported by the DOE.