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Observation of annealing of grains in high purity aluminum using High Energy X-ray Diffraction Microscopy C.M. HEFFERAN, S.F. LI, Carnegie Mellon University, U. LIENERT, Argonne National Labortory, R.M. SUTER, Carnegie Mellon University — High energy x-ray diffraction microscopy (HEDM) is capable of measuring volumes of polycrystal microstructure on a granular basis, producing spatial maps of crystallographic orientation covering ensembles of grains with micron resolution. A non-destructive experimental probe capable of observing the response of polycrystals to thermo-mechanical stimulus, HEDM establishes constraints on analytic materials models. HEDM uses high-brilliance, line focused synchrotron x-rays to image diffracted beams emanating from individual grains in a succession of planar sections. Area detector images of diffraction patterns are collected as the sample rotates normal to the beam plane. A forward modeling computer simulation adjusts local crystallographic orientations and compares simulated scattering to experimental images in order to optimize the match with observations. Three dimensional digital representations are generated from large numbers of reconstructed sections. Growth measurements on high purity polycrystalline aluminum have been conducted at the 1-1D beamline at the Advance Photon Source at Argonne National Laboratory and reconstructions have been obtained using the Pittsburgh Supercomputing Center. Both defect annealing and grain boundary motions have been observed and will be described.

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