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Towards mapping of defected grains using high energy x-ray diffraction microscopy SHIU FAI LI, C.M. HEFFERAN, Carnegie Mellon University, U. LIENERT, Argonne National Laboratory, R.M. SUTER, Carnegie Mellon University — High energy x-ray diffraction microscopy (HEDM), the use of focused high energy synchrotron x-ray radiation diffraction imaging, is becoming a promising technique for orientation mapping of polycrystalline material. The nondestructive nature of HEDM makes real-time observation of inter- and intra-grain dynamics possible. Collected HEDM data in the form of diffracted images on a high resolution 2D detector is analyzed by a Monte Carlo fitting algorithm using a forward modeling method, which simulates a set of detector images based from a specified orientation field. Since no specific assumptions are made regarding grain shapes and topologies, internal mosaic structures may be captured. The combination of nondestructive nature and intra-grain resolution makes it an ideal candidate for in situ studies of grain damage due to strain/stress treatment. A proof of concept has been demonstrated in observations of intra-grain orientation mosaics from both orientation maps of polycrystalline aluminum obtained from experiments conducted at beam line 1-ID of the Advanced Photon Source and forward modeling simulations.

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