NEW ELECTRON MICROSCOPY TECHNIQUES FOR DETERMINATION OF LOCAL STRUCTURAL FEATURES DURING PLASTIC DEFORMATION

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This talk will highlight recent advances in Transmission Electron Microscopy (TEM) techniques that provide insight into small-scale plasticity and the evolution of defect structures in materials. Through the development of fast direct electron detectors, it is now possible to acquire large multidimensional data sets of nanodiffraction patterns (4DSTEM) that can map local structural order and strain with nanometer precision, even during in situ nanomechanical testing. The method is widely applicable and examples will be given from systems such as organic semiconductor molecular thin films, structural alloys with local order such as Ti-Al and CrCoNi, and even to amorphous samples such as bulk metallic glass. This talk will describe our recent results utilizing fast direct electron detectors, energy filtered imaging and in situ TEM nanomechanical testing that provide insight into multiscale materials phenomena using these techniques.