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Line profile analysis of single crystals using 3D diffraction data

Abstract:
Line profile (LP) analysis of diffraction data is a widely used technique for determining the microstructure of crystalline materials. Despite its indirect nature, LP analysis is a reliable and powerful method that provides valuable insights into various microstructural properties. For polycrystalline materials with near-random textures, LP analysis can be used to determine dislocation density, coherent domain size, stacking faults, the relative occurrence of different dislocation slip modes, and the arrangement of dislocations within the material. Although several profile fitting methods have been developed for powder diffraction data, the literature on single-crystal diffraction line profile fitting is notably sparse, with essentially only one method being documented. In this presentation, it will be demonstrated how this method can be effectively applied to in-situ measurements using synchrotron diffraction data. And how can be evaluated in a polycrystal each grain separately determining each grain dislocation density, partial dislocation densities and grain size. It will be shown how this approach can be used to evaluate each grain in a polycrystal individually, determining the dislocation density, partial dislocation densities, and grain size for each grain.