

3D and 4D orientation and strain mapping in polycrystalline materials

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3DXRD

diffraction microstructure

Stress & Strain

imaging

Abstract In this talk we will review recent developments and challenges in the field of synchrotron X-ray diffraction imaging related to instrumentation, data reduction and analysis strategies. New detectors, ongoing software developments and the upgrade of synchrotron facilities have promoted the development of a large portfolio of “diffraction microstructure imaging” (DMI) techniques, which start to be routinely used at high energy synchrotron sources and which have established themselves as cutting edge tools in microstructure characterization [1]. Similar to electron microscopes, modern synchrotron instruments can offer multimodal 3D bulk characterization (phase contrast, diffraction, fluorescence, ...) down to sub-micrometer length scales. We will showcase how these techniques can be used to gain new insight on classical topics of metallurgical research like recrystallization [2], grain growth [3], strain localization [4], phase transformations and stress-corrosion cracking. We will finally give a short outlook on ongoing developments in Bragg coherent X-ray diffraction and 4D STEM, which can bridge the resolution gap down to the nanometer length-scale [5].

References

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