Characterization of multiphase systems with lab-based diffraction contrast tomography

Florian Bachmann*[1], Olivia Barbee[1], Erik Lauridsen[1], Jette Oddershede[1], and Sun Jun[1]

[1]Xnovo Technology Aps – Denmark

Abstract

The complementary combination of absorption contrast microCT and lab-based diffraction contrast tomography (DCT) allows the multimodal three-dimensional characterization of polycrystalline multiphase microstructures. Previously, lab-based DCT only enabled indexing of multiple phases one-by-one, which required individual phase maps to be stitched together. Recently, more flexible workflows for indexing the crystallographic orientations of grains representing different phases have been implemented.
Basically, two different approaches can be used after segmenting the absorption volume into phase labels, either: 1) index each crystallographic phase individually using a single-phase label as a region of interest, or 2) index multiple crystallographic phases simultaneously within a single-phase label. The first approach requires a correctly assigned one-to-one mapping of the crystallographic phase to the labeled phase identified by the absorption contrast. The latter many-to-one approach puts certain demands on the crystallographic phases involved for the indexing to be unambiguous. Both cases will be discussed and the particularities of each will be addressed.
Application cases will exemplify the typical workflows for processing geological and material science multiphase samples and the challenges involved, as well as the scientific impact of multiphase crystallographic imaging.

Keywords: Lab-based DCT, multi-phase, multi-modal imaging, microCT

*Speaker