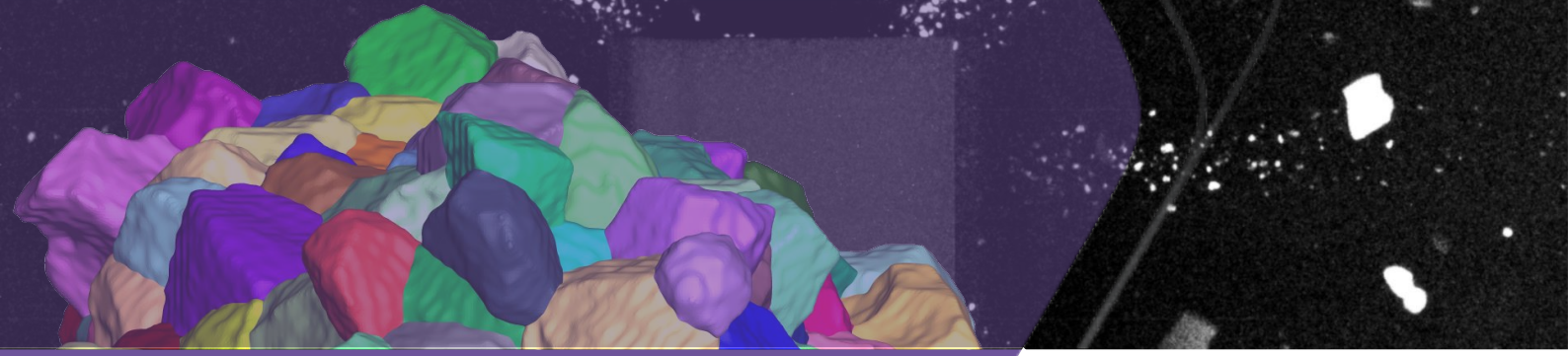

GrainMapper3D *Spotlight*

Silicon/Corundum/Quartz Multi-phase Sample

GrainMapper3D v4.0 Multi-phase Indexing

GrainMapper3D 4.0 introduces *Multi-phase Indexing*, allowing users to simultaneously reconstruct multiple crystalline phases. This feature, along with other new functionalities designed for analyzing multi-phase materials, offers users enhanced flexibility and new possibilities for investigating specific phases within their samples. For example, users can directly correlate crystallographic data with phase information in complex material contexts.

In the highlighted example, a three-phase engineered sample consisting of silicon cubes, corundum spheres, and quartz cubes is showcased. The reconstructed 3D phase and grain maps demonstrate the phase and orientation information output by GrainMapper3D v4.0 and beyond.

Sample Description

Quartz cubes, silicon cubes and ruby spheres.

Crystal System	*Materials*	Dimensions
trigonal ($P3_221$)	*quartz*	1.0 mm^2
cubic ($Fm\bar{3}m$)	*silicon*	100 μm^2
trigonal ($R\bar{3}m$)	*corundum*	150 µm (ø)

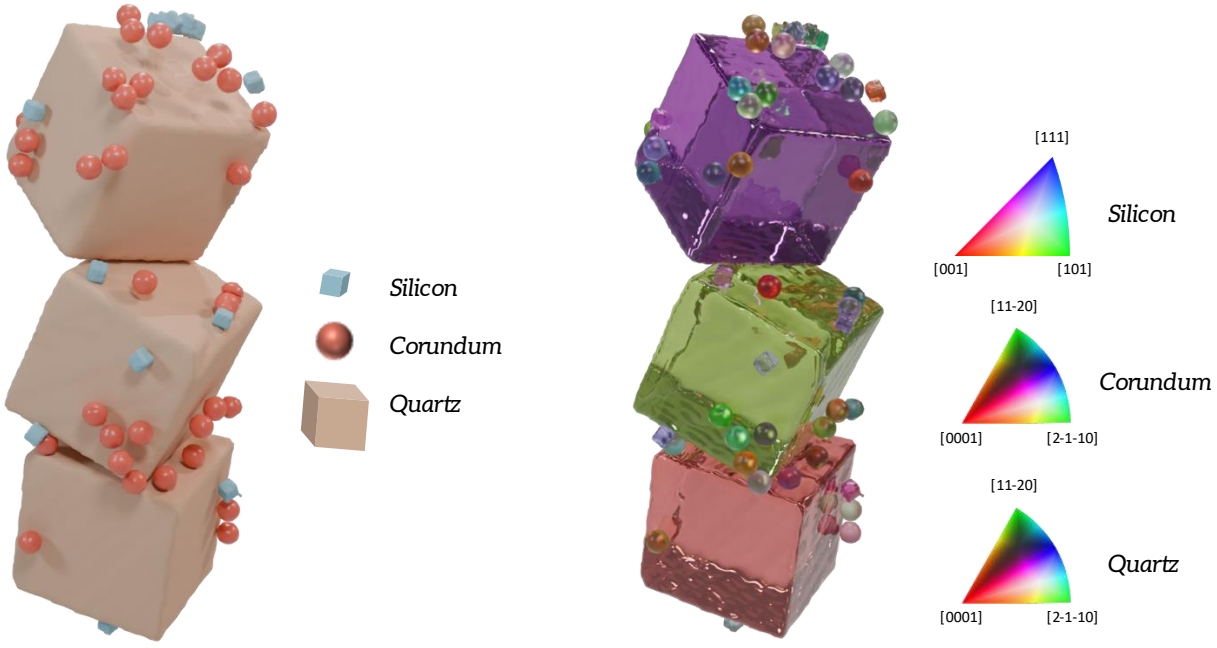

Figure: stacked quartz cubes, interspersed with randomly distributed silicon cubes and ruby spheres. Top: Reconstructed 3D phase map distinguishing materials; Bottom: orientation map with grains colored according to crystallographic orientation (inverse pole figure).

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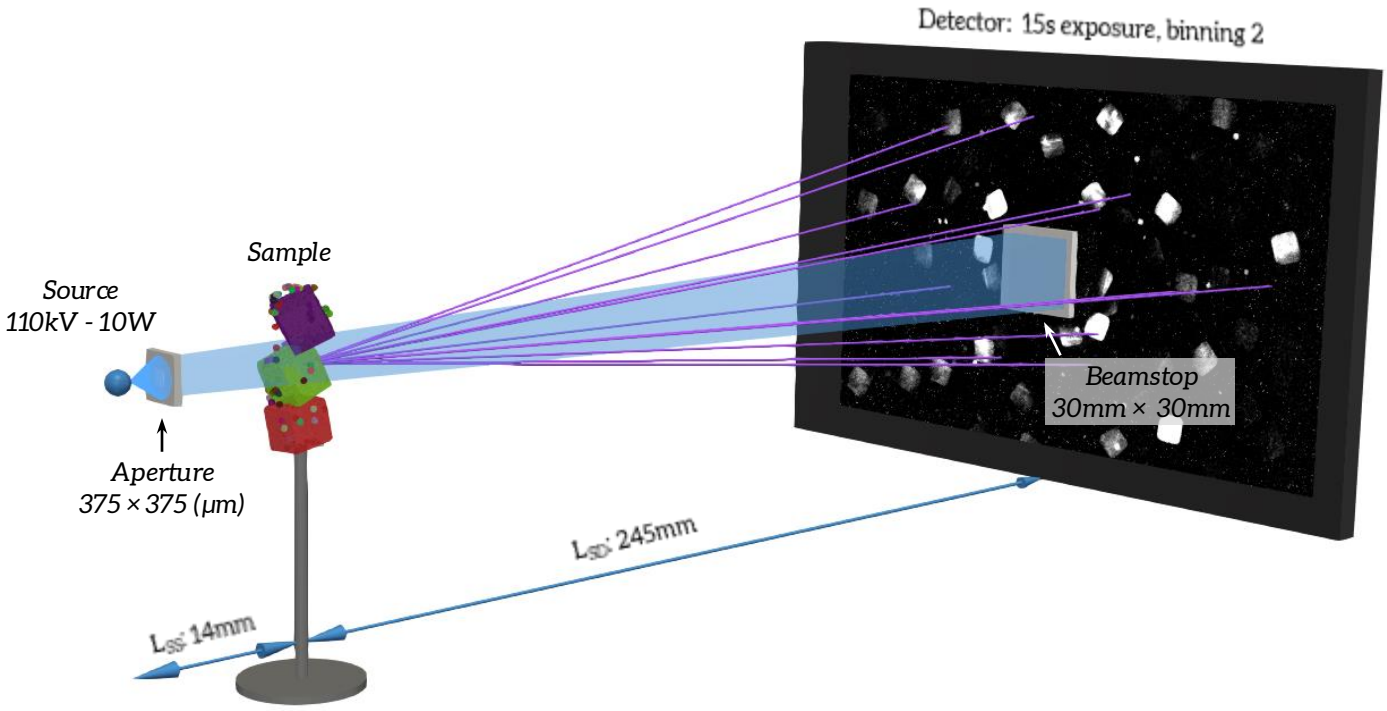

Figure: Schematic illustration of the setup for diffraction contrast tomography data acquisition of the multiphase sample. Key acquisition parameters are marked.

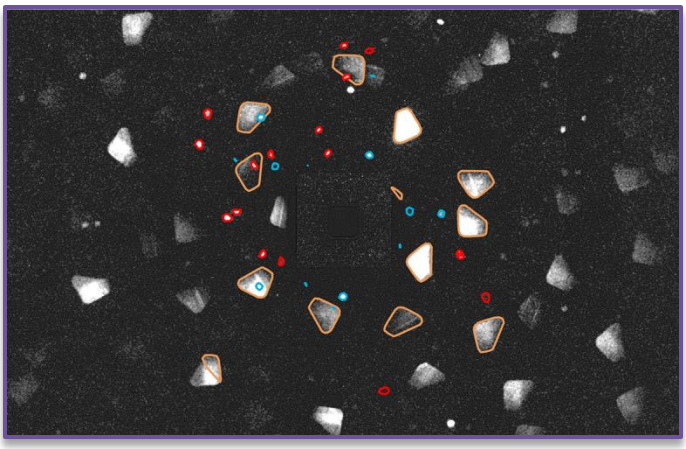

Figure: (Left) Example absorption contrast projection at a certain rotation angle. (Right) Colored segmentation of multiphase diffraction pattern: orange: quartz; red: corundrum; blue: silicon, with spot shapes mirror the grain sizes and shapes.

Data Acquisition Parameters

System: ZEISS Xradia 520 Versa with LabDCT Pro

Absorption Contrast Tomography

- *Voltage*: 80 kV
- *Power*: 7 W
- *Objective*: 0.4X
- *Source – Sample distance*: 16 mm
- *Sample – Detector distance*: 240 mm
- *Exposure*: 1s / binning 2
- *Number of projections*: 1024
- *Voxel size*: 4.31 µm

Diffraction Contrast Tomography

- *Data acquisition mode:* Helical Phyllotaxis
- *Aperture*: DCT 375 × 375 (µm × µm)
- *Voltage*: 110 kV
- *Power*: 10 W
- *Objective*: Flat Panel Detector
- *Source – Sample distance*: 14 mm
- *Sample – Detector distance*: 245 mm
- *Exposure*: 15s / binning 2
- *Number of projections*: 5596
- *3D Grain Map voxel size*: 10 µm

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