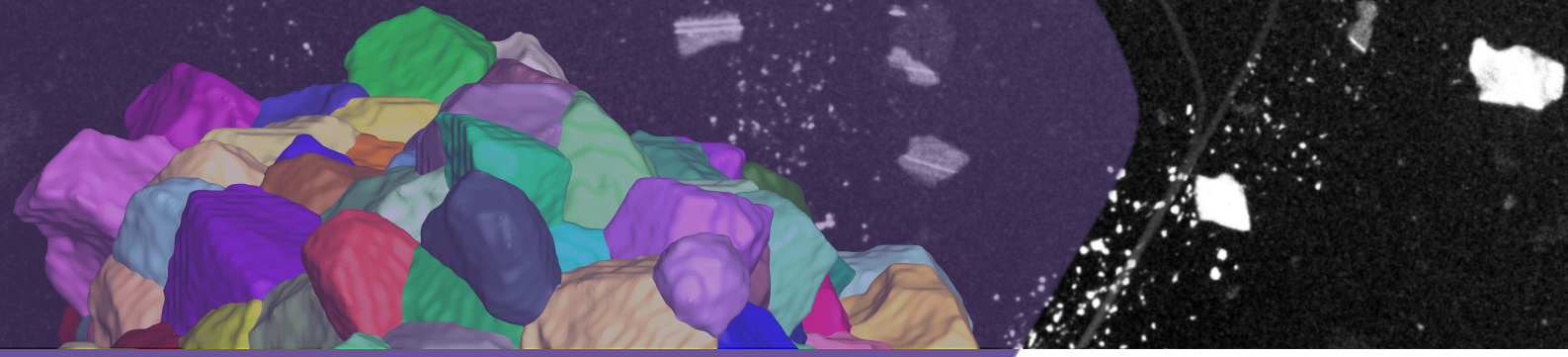


GrainMapper3D *Spotlight*

Al-5wt%Cu Sample Annealing Series

Open access datasets:
https://doi.org/10.18126/5Q8S-3EF9

Sample Description

- Al-5wt% Cu
- Crystal system: face-centered cubic (Fm3m)
- Dimension: 1.4 mm (diameter) × 6.5 mm (length)
- Annealing treatment: 15 min @ 630°C, air cooling to RT
- Annealing steps: 10

Sample Courtesy: Dr. Jules Dake, Ulm University, Germany

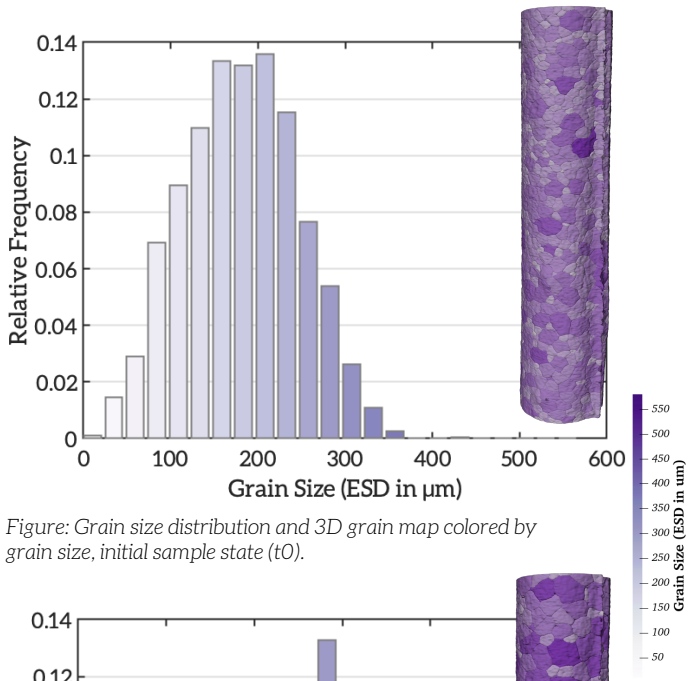


Figure: Grain size distribution and 3D grain map colored by grain size, initial sample state (t0).

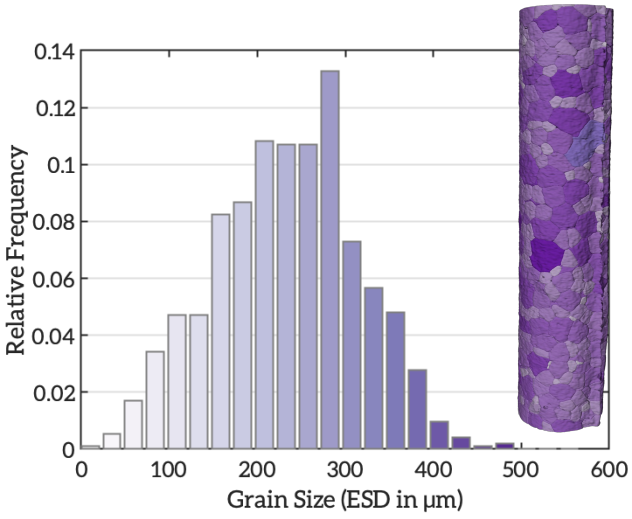
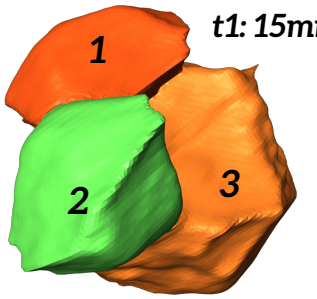
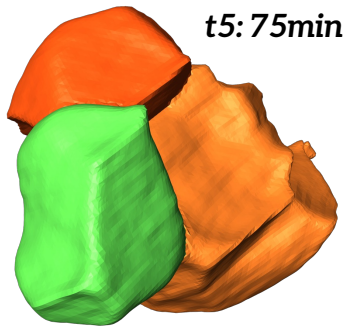


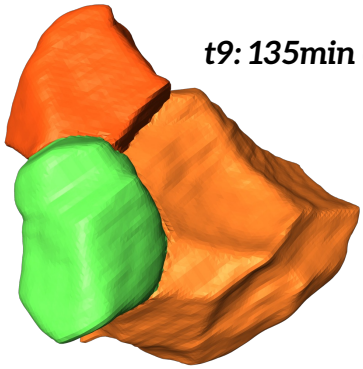
Figure: Grain size distribution and 3D grain map colored by grain size, after 10th annealing step (t10).



t1: 15min @630 ℃



t5: 75min @630 ℃



t9: 135min @630 ℃

Grain size (ESD in µm)	***t1***	***t5***	***t9***
Grain 1	*244.2*	*243.6*	*233.6*
Grain 2	*231.5*	*243.7*	*215.9*
Grain 3	*362.7*	*394.3*	*427.9*

Figure: Evolution of three neighboring grains after 15min, 75min and 135min annealing at 630 ℃ respectively. The grain sizes in equivalent sphere diameter are given in the table.

References:
1) *J.M. Dake et al., (2016). PNAS, 113, E5998.*
2) *Dr. –Ing. Thesis, Jules Dake, Ulm Univ. 2019.*
3) *J. Sun et al., (2024). Tomography of Materials and Structures, 4, 100025.*

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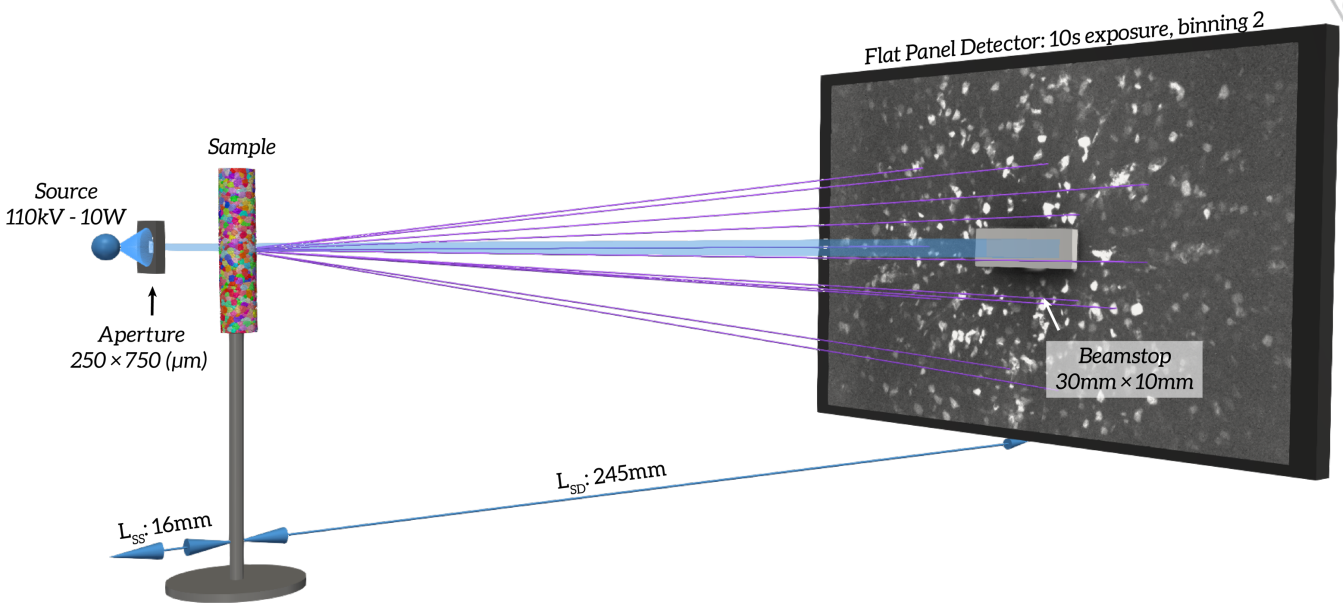

Figure: Schematic illustration of the setup for diffraction contrast tomography data acquisition of the Al-5wt%Cu sample. Key acquisition parameters are marked. In this case, projection geometry is used with geometrical magnification factor of 16.4.

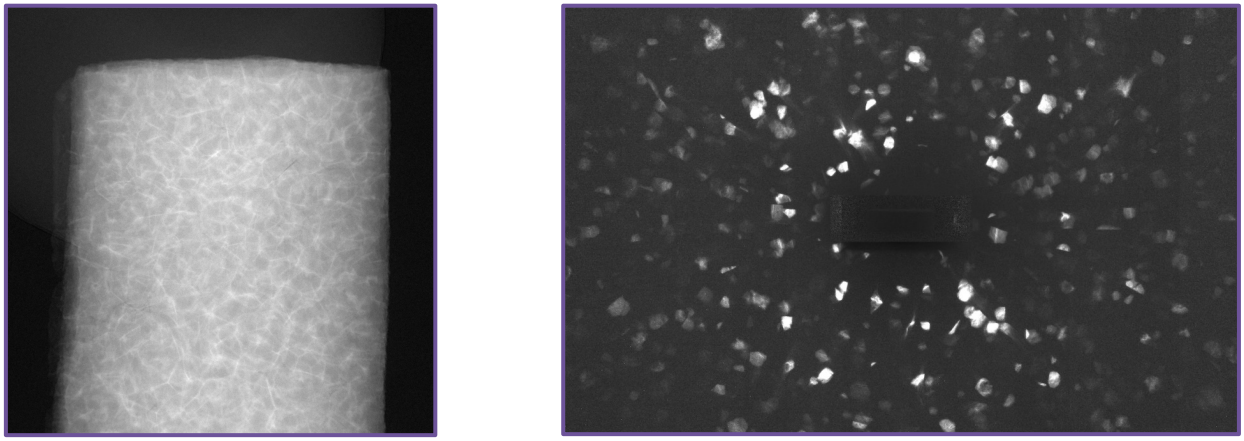

Figure: (Left) Example absorption contrast projection at a certain rotation angle. The Cu-rich phase, which mainly segregates at grain boundaries, appears brighter given a higher attenuation coefficient. (Right) Example diffraction contrast projection at a certain rotation angle.

Data Acquisition Parameters

System: ZEISS Xradia 520 Versa with LabDCT Pro

Absorption Contrast Tomography

- *Data acquisition: vertical stitching (5 layers)*
- *Voltage*: 80 kV
- *Power*: 7 W
- *Objective*: 4× Detector
- *Source – Sample distance*: 13 mm
- *Sample – Detector distance*: 35 mm
- *Exposure*: 1s / binning 2
- *Number of projections*: 1601
- *Voxel size*: 1.84 μm

Diffraction Contrast Tomography

- *Data acquisition mode:* Helical Phyllotaxis
- *Aperture*: DCT 250 × 750 (μm × μm)
- *Voltage*: 110 kV
- *Power*: 10 W
- *Objective*: Flat Panel Detector
- *Source – Sample distance*: 16 mm
- *Sample – Detector distance*: 246 mm
- *Exposure*: 10s / binning 2
- *Number of projections*: 2900
- *3D Grain Map voxel size*: 6 μm

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