Workflow idea 3

3D grain analysis

Goal: Analyze grains in a 3D dataset generated by scanning a rock sample on a Versa X-ray microscope (similar to computed tomography technique).

A grain can be multi-phase, so a single grain can have multiple densities (grey levels). And the fact that a high density member of the grain is exposed to the outside of the grain vs. being fully embedded is important.

Recommended workflow:
*   Detect individual grains in 3D (grains have regions with multiple grey levels)
*   Report total volume fraction of each phase (regions within a given grey level window)
*   Report individual grain parameters (volume, surface area, shape, mean grey level)
*   Report % bright phase area exposed to outside the grain (surface area of bright on a grain surface / surface area of entire grain)

Expected difficulty level: Hard

Expected challenge(s): Detection of entire grains and calculation of exposed high density regions in individual grains.

PS: You can pick one of the two datasets provided. Images on the following slides.
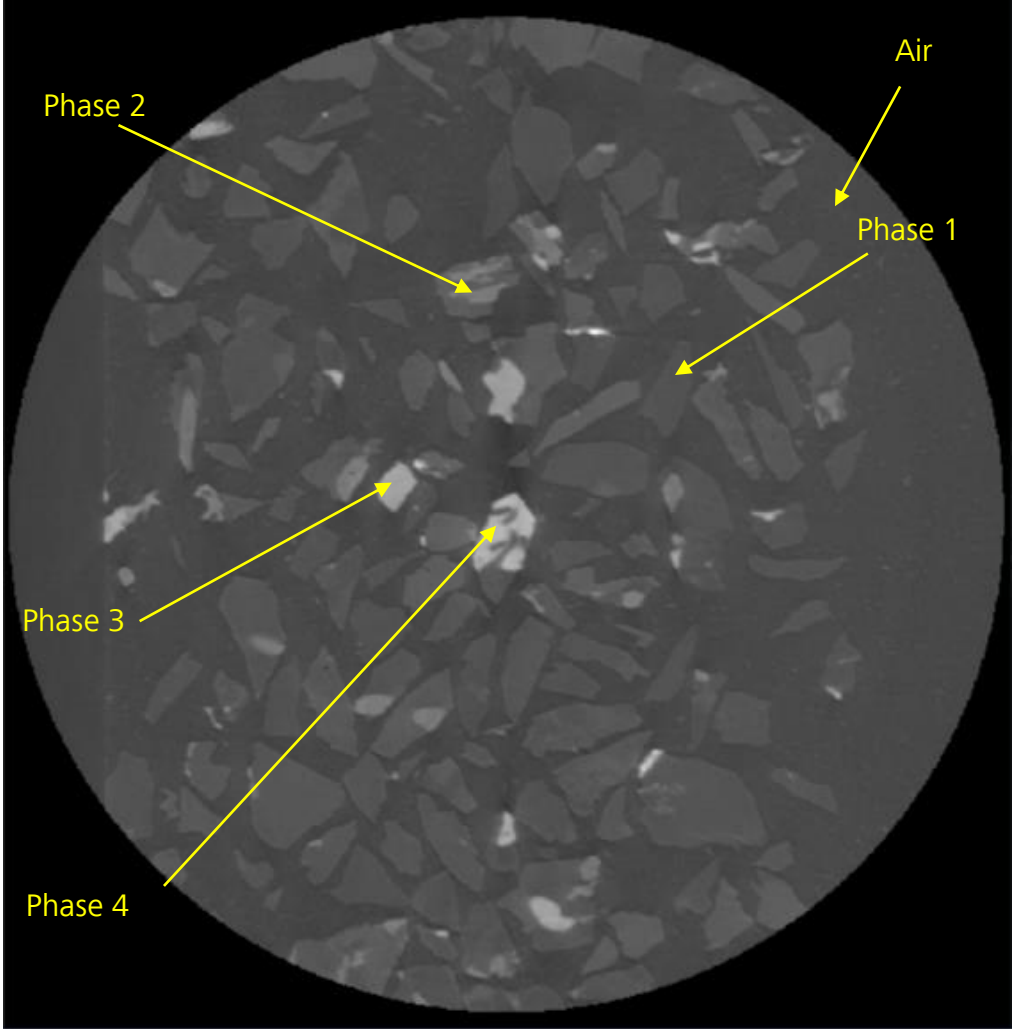
Dataset 1
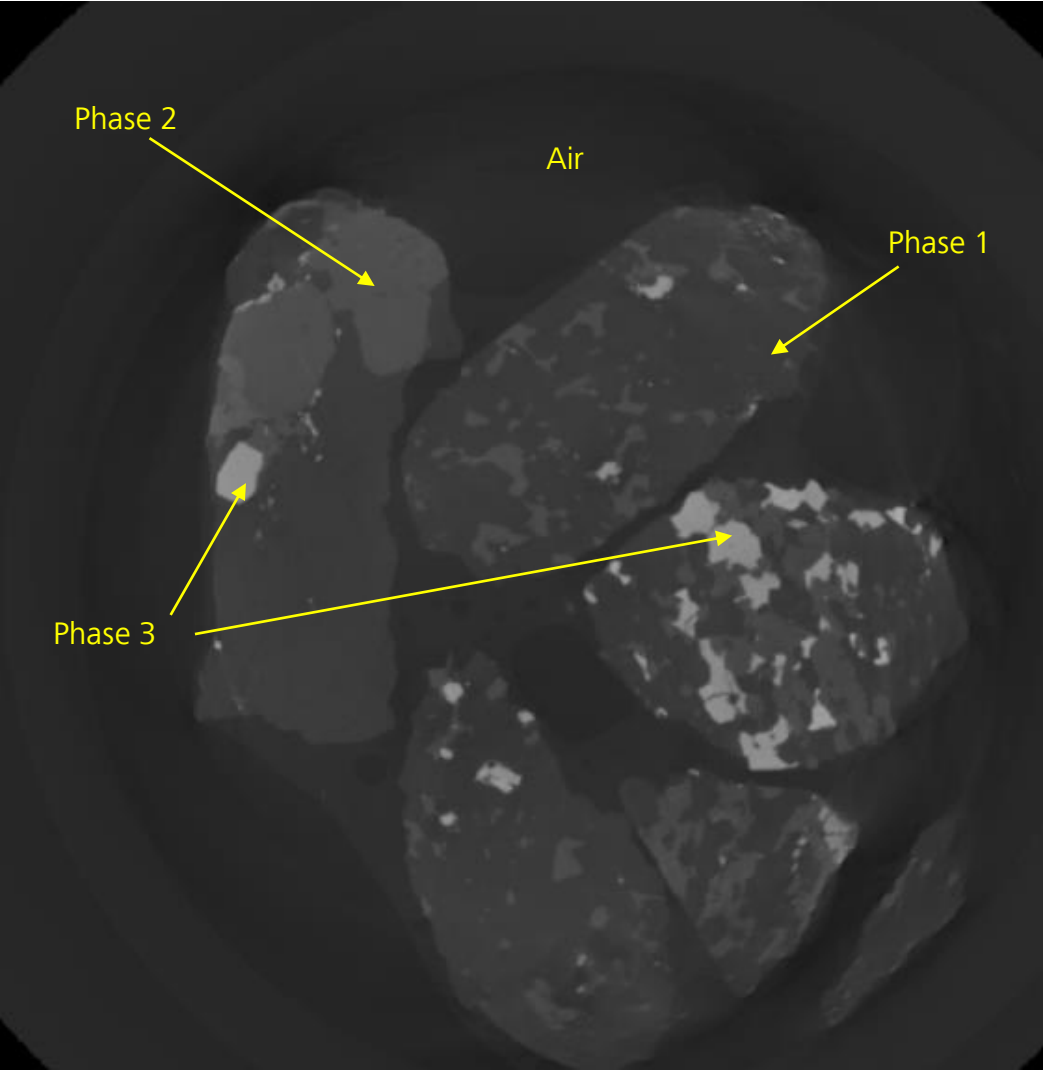
Dataset / image information:

File name: WF03_3DParticles-1721slices_13.6um_voxel.czi

File Information	
Name	WF03_3DParticles-1721slices_13.6um_voxel
File Type	Carl Zeiss Image (*.czi)
File Path	E:\APEER_contest_datasets\03_3D_particle_analysis\WF03_3DParticles-1721slices_13.6um_voxel.czi
File Size	3.61 GB
Created	3/5/2019 4:04:20 PM
Modified	3/5/2019 4:04:56 PM
User	
Compression Method	Uncompressed
Compression Quality	100

Image Dimensions	
Z-Stack	1721 Slices
Scaling (per Pixel)	13.62 μm x 13.62 μm x 13.62 μm
Image Size (Pixels)	1049 x 1073
Image Size (Scaled)	14.28 mm x 14.61 mm
Bit Depth	16 Bit

Note: The image is in .czi format. Please read the last page of this document for instructions on how to read czi files.

Dataset 2

Dataset / image information:

File name: WF03_3DParticles-901slices_2.5um_voxel.czi

File Information	
Name	WF03_3DParticles-901slices_2.5um_voxel
File Type	Carl Zeiss Image (*.czi)
File Path	E:\APEER_contest_datasets\03_3D_particle_analysis\WF03_3DParticles-901slices_2.5um_voxel.czi
File Size	1.68 GB
Created	3/5/2019 1:03:06 PM
Modified	3/5/2019 1:00:42 PM
User	
Compression Method	Uncompressed
Compression Quality	100

Image Dimensions	
Z-Stack	901 Slices (2.25 mm)
Scaling (per Pixel)	2.50 µm x 2.50 µm x 2.50 µm
Image Size (Pixels)	988 x 1011
Image Size (Scaled)	2.47 mm x 2.53 mm
Bit Depth	16 Bit
Image Center Position	X: -2.29 mm, Y: -635.18 µm

Note: The image is in .czi format. Please read the last page of this document for instructions on how to read czi files.