# The DCM software: Modelling, characterizing and visualizing material microstructure in 3D

- Generate digital 3D representation of material compositional phases in a sample using the data-constrained modelling methodology and X-ray CT data, even for the cases that there are partial volumes of multiple phases in the same image voxel;

- Visual presentation of 3D volumetric data. The visualization is compatible with various display devices, including stereo 3D monitors;

- Exporting 3D data in various formats, including the web-friendly Web3D format for interactive 3D online visualization;

- Functionality of the software can be extended by adding plug-in modules to perform virtually unlimited 3D modelling. A set of C++ programming API is included for user convenience.

The DCM approach

Quantitative and sample-non-destructive (SND) characterization of 3D microscopic composition distribution in materials is important to a broad range of R&D disciplines. Although the X-ray CT and threshold image segmentation approach is widely used, it is subjective and imposes an arbitrary length-scale cut-off at the X-ray CT pixel size. This makes it inadequate for materials with finer structures than the imaging pixels or with similar X-ray attenuation properties.

DCM	
	Data
	Constrained
	Modelling
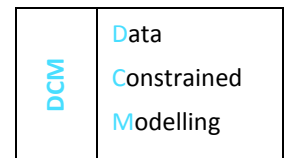
By integrating statistical physics and multi-energy quantitative X-ray CT, DCM (http://research.csiro.au/dcm) explicitly reconstructs 3D microscopic distributions of materials and incorporates fine structures below X-ray CT image resolution as voxel compositional partial volumes. This offers a more accurate 3D representation of a material microstructure and enables more quantitative modelling of its properties. DCM has been implemented as a user-friendly software, and has been applied in advanced materials science, additive manufacturing, energy and mineral resources.
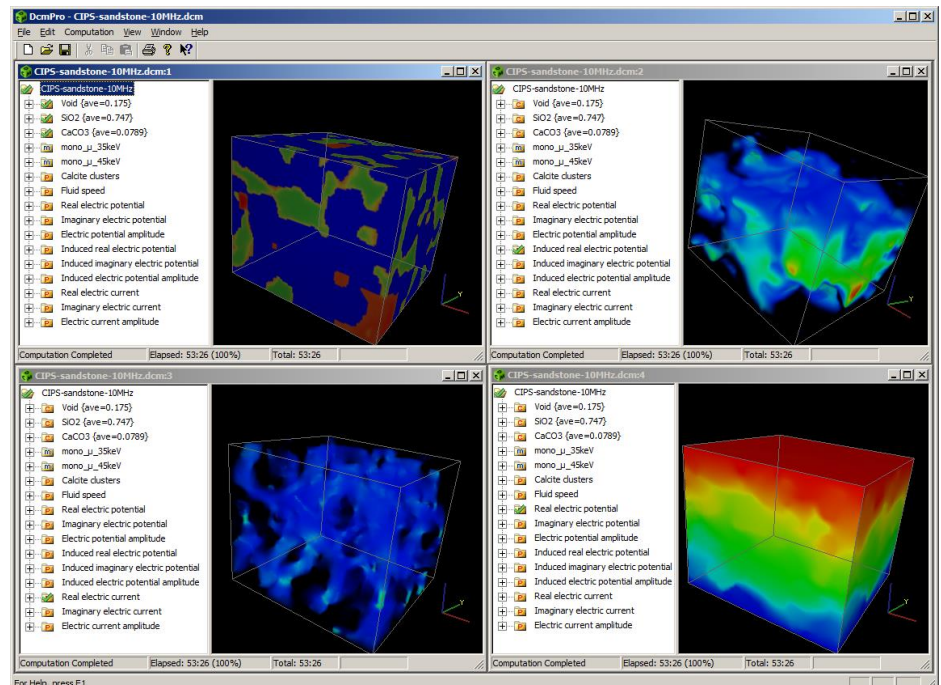
DCM advances the competitive leading edge

- For X-ray CT equipment suppliers, incorporating DCM technology will elevate equipment accuracy in resolving material compositions and can even reveal information below imaging resolution.
- For advanced imaging analysis and visualization software suppliers, inclusion of DCM modules will boost the analysis capability and broaden the customer base to those who have stringent requirements in quantitative analysis.
- For the R&D community who would like to extract 3D compositional information from X-ray CT data and model the material properties based on material microstructures, DCM is available as a stand-alone software package.

## Derive material 3D microstructures based on material properties

Seeing is believing. The following case is related to a carbonate rock sample which has been X-rayed at 1.85 micron pixel size. Carbonate is one of the common tight-reservoirs for oil & gas which is dominated by sub-micron pores. We leave it to your professional judgement about whether or not it could be correctly segregated using image grey-scale thresholding.
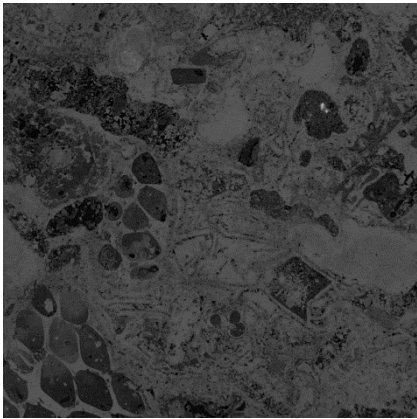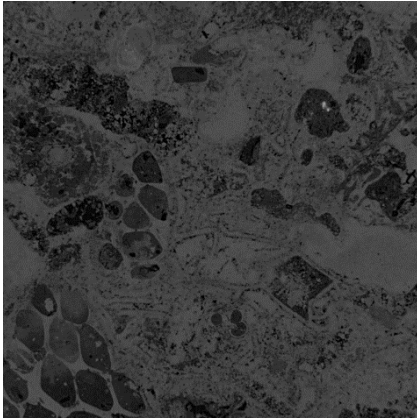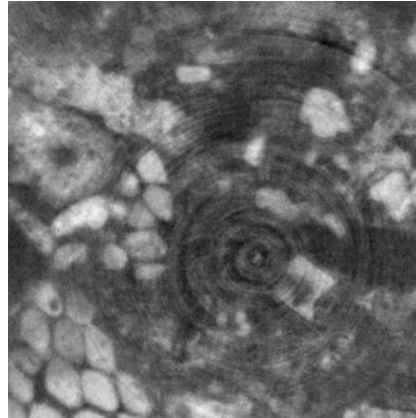

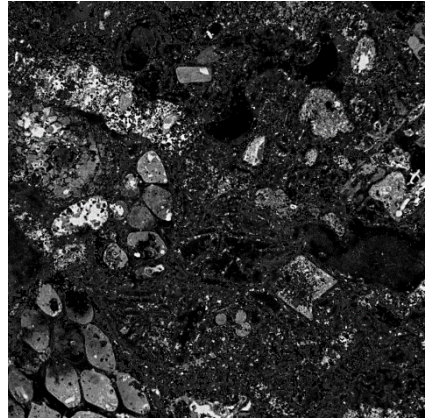**X-ray CT slice at 28keV**
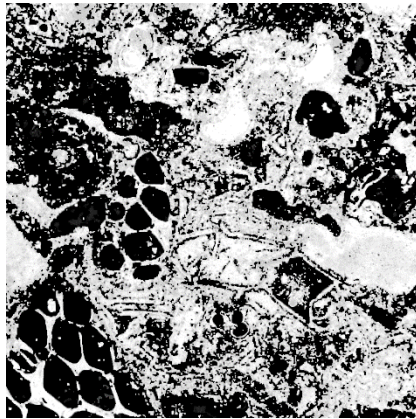
DCM reconstructed calcite phase
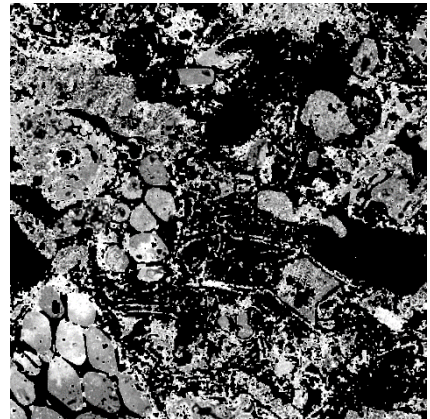
DCM reconstructed dolomite phase

X-ray CT slice at 38keV

Xe gas K-edge derived porosity slice

DCM reconstructed porosity slice

Working with us

Please feel free to contact us if you would be interested in acquiring a DCM software user licence, R&D collaboration, commercial exploitation, or knowing more about DCM.