
DVC Challenge

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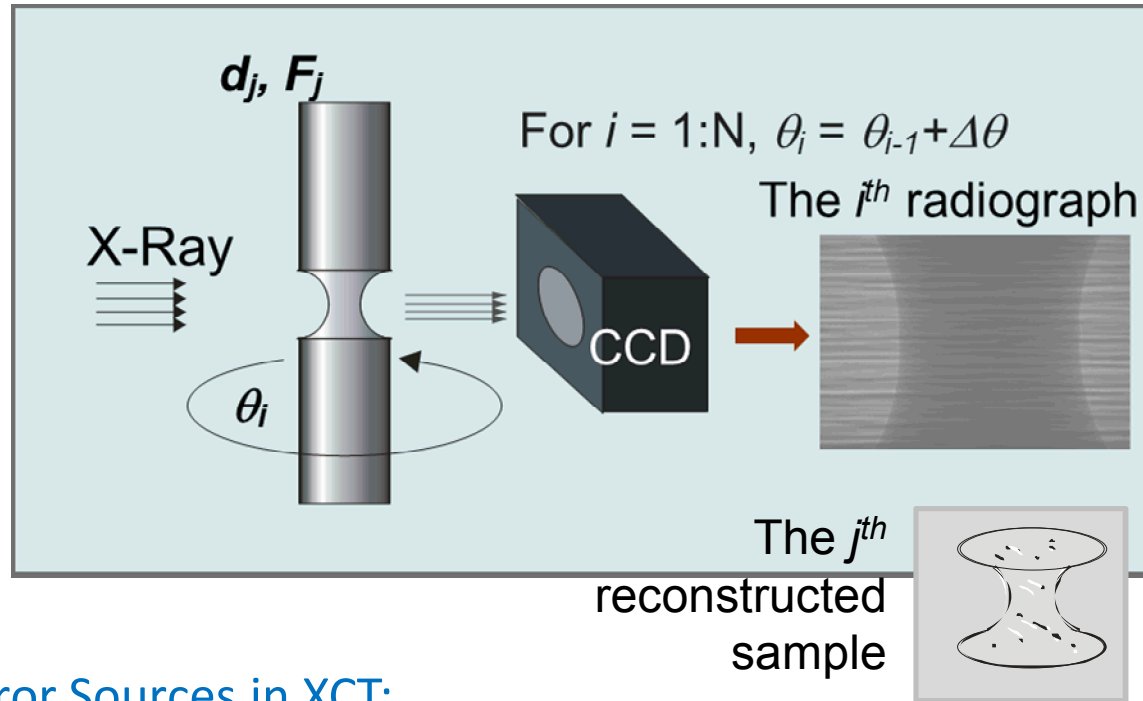
Sandia National Laboratories, Livermore, CA

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Goal: Quantify Bias Levels in Different CT Scans and Image Reconstructions



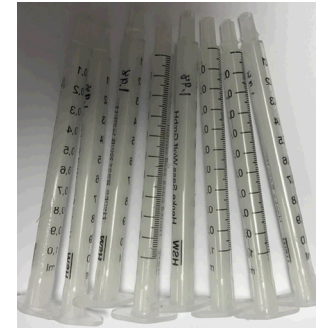
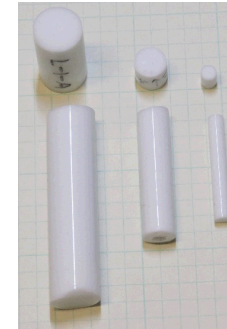
Error Sources in XCT:

- Instability in image scan
- Image distortion
- Reconstruction
- Sample holder/stage precision

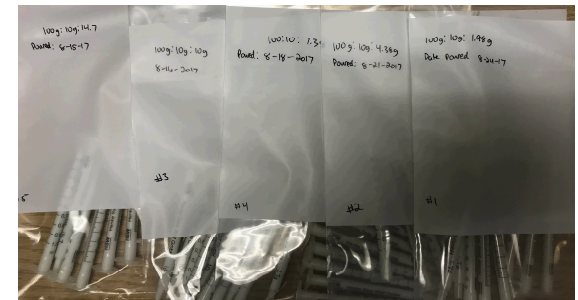
Material: Sylgard® 184 Impregnated with A16 Glass Micro-Balloons (GMBs)

Sylgard 184 Impregnated with A16 GMBs:

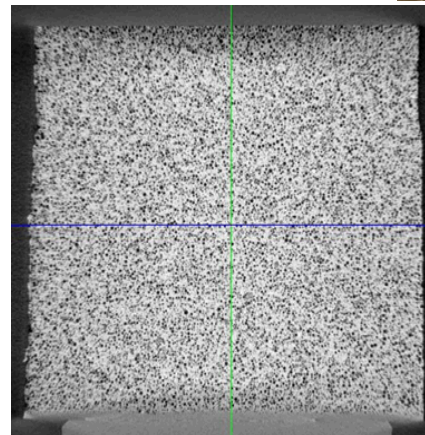
- GMBs randomly mixed with Sylgard resin
- GMBs with average size $70\text{ }\mu\text{m}$ and 10%~90% distribution at $35\sim 115\text{ }\mu\text{m}$
- Syringe-molded cylinder specimens with different diameters and volume fractions
- Specimens with different volume fraction of GMBs
- Hollow GMBs and Sylgard resin provide nice contrast and pattern in XCT image



Syringe molded specimens



Specimens with different volume fraction

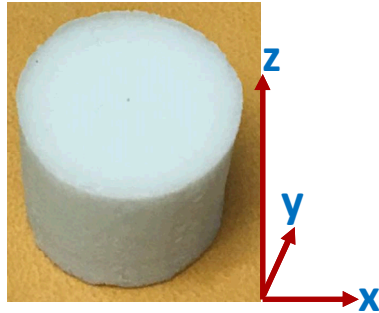


XCT image of Sylgard with GMBs

Specimens:

Cylinder Sylgard specimen

- diameter 5 mm
- height 5 mm
- 40%vol GMB
- GMB 70 μm



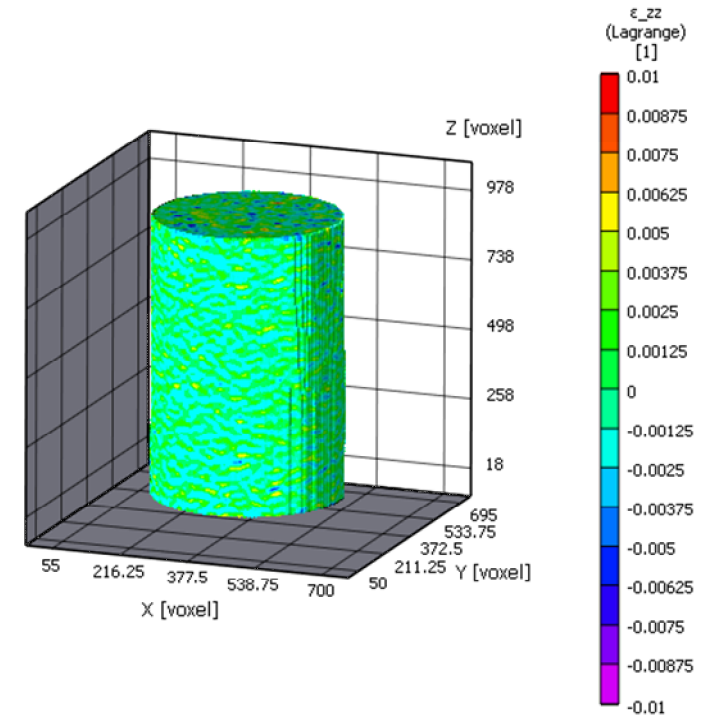
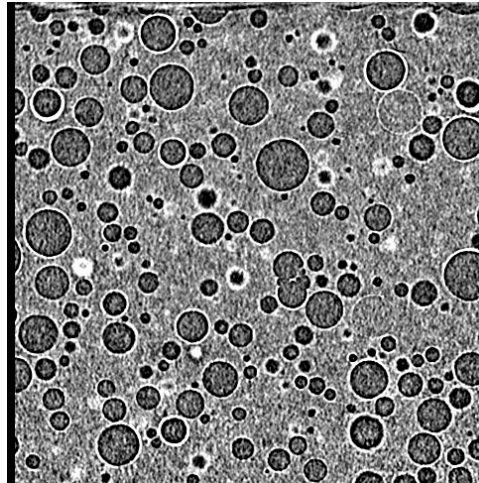
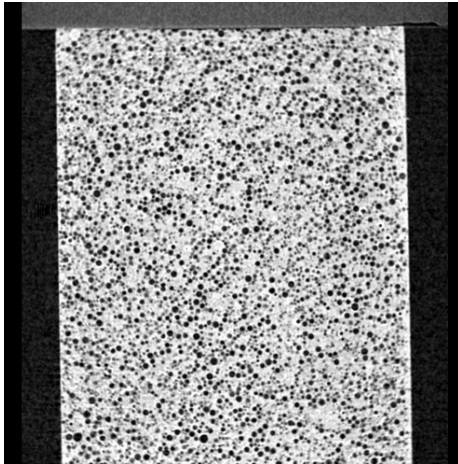
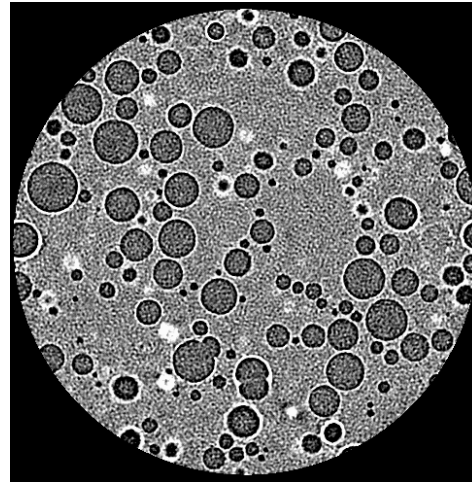
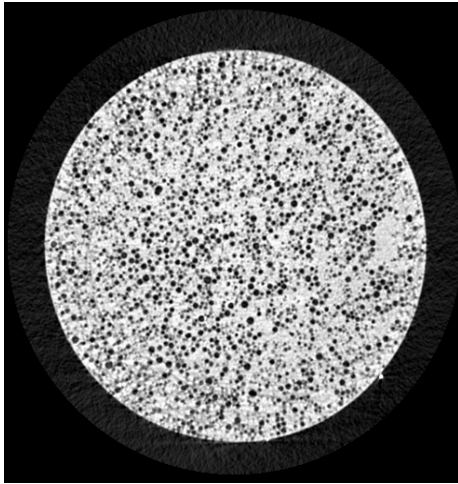
Scan parameters:

- Scan size : 7x7 mm
- Image size: 1000 x 1000 voxels
- Speckle size varies mostly from 5~25 voxels in diameter

Test scans:

- (1) Sample centered on the rotation stage and collect three consecutive scans without any change; (sample axis and rotation axis aligned)
 - (2) Offset specimen in Z direction by 1.0mm and take two repeatable scans.
 - (3) Back to original Z and offset specimen 1mm in X axis (specimen and rotation axis offset 1mm) and take two repeatable scans.
- Total of 7 scans, 3 for consecutive scans without any change and 4 for rigid body motion.

Preliminary Scans and DVC



Low resolution

High resolution