

# DVC Challenge

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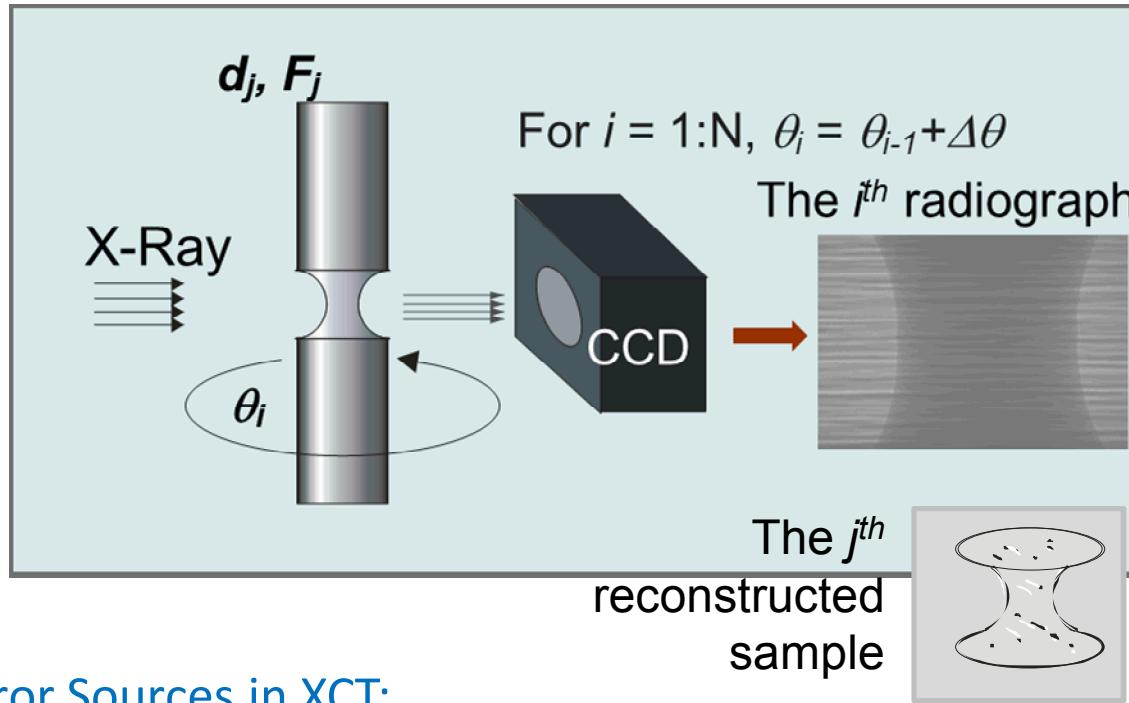
Sandia National Laboratories, Livermore, CA

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



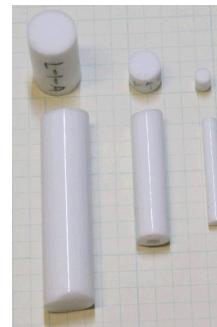
## Error Sources in XCT:

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

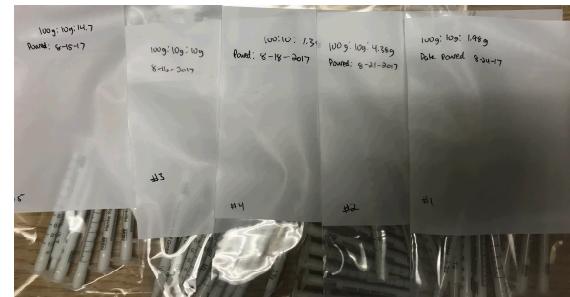
# Material: Sylgard® 184 Impregnated with A16 Glass Micro-Balloons (GMBs)

## Sylgard 184 Impregnated with A16 GMBs:

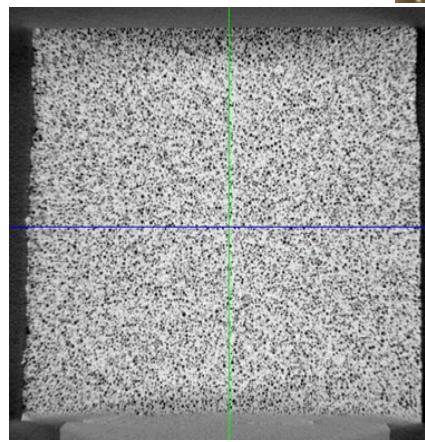
- GMBs randomly mixed with Sylgard resin
- GMBs with average size 70  $\mu\text{m}$  and 10%~90% distribution at 35~ 115  $\mu\text{m}$
- Syringe-molded cylinder specimens with different diameters and volume fractions
- Specimens with different volume fraction of GMBs
- Hollow GMBs and Sylgard resin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



Syringe molded specimens



Specimens with different volume fraction



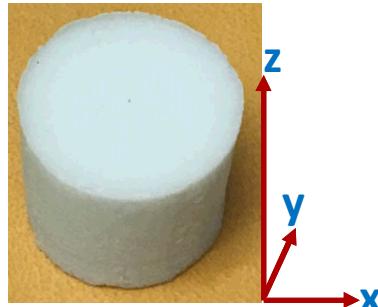
XCT image of Sylgard with GMBs

# Experiments

## Specimens:

### Cylinder Sylgard specimen

- diameter 5 mm
- height 5 mm
- 40%vol GMB
- GMB 70  $\mu$ m



## Scan parameters:

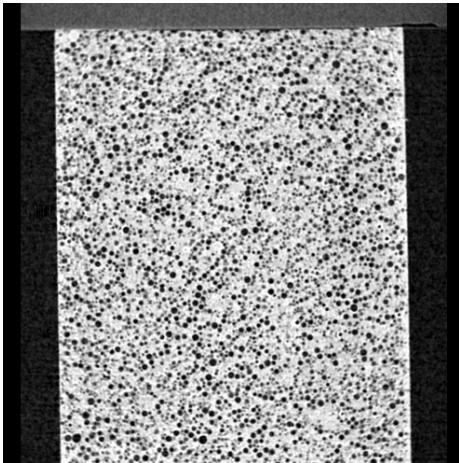
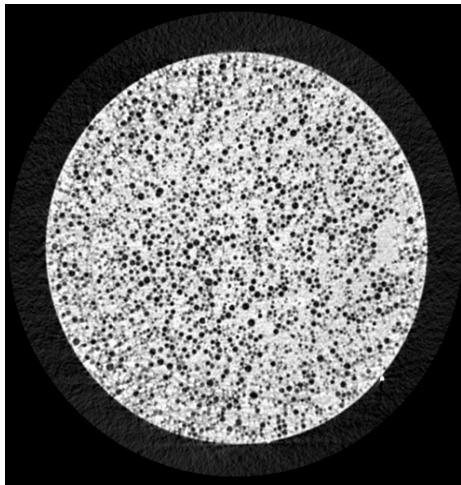
- Scan size : 7x7 mm
- Image size: 1000 x 1000 voxels
- Speckle size varies mostly from 5~25 voxels in diameter

## Test scans:

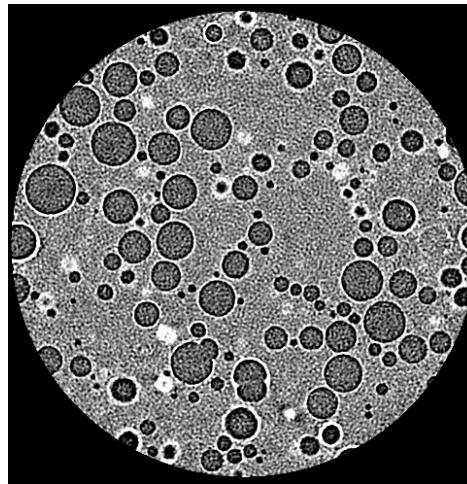
- (1) Sample centered on the rotation stage and collect three consecutive scans without any change; (sample axis and rotation axis aligned)
- (2) Offset specimen in Z direction by 1.0mm and take two repeatable scans.
- (3) Back to original Z and offset specimen 1mm in X axis (specimen and rotation axis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

