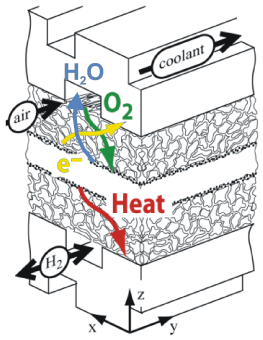
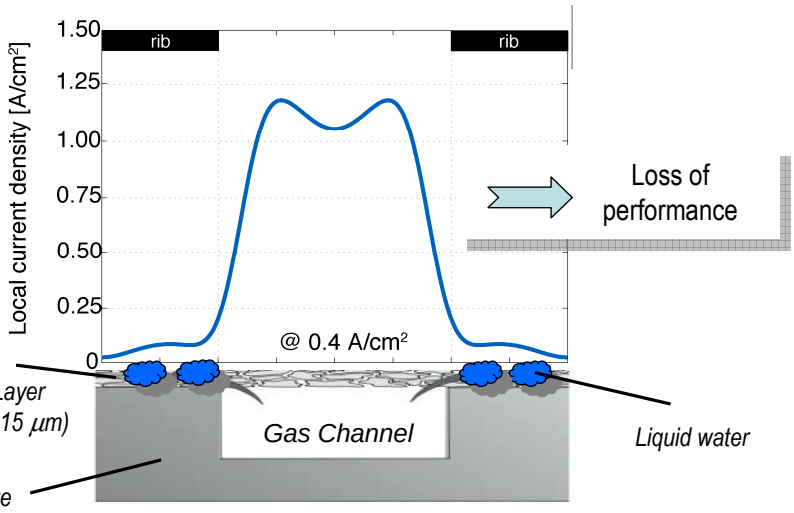
X-Ray Tomography of Water in Operating Fuel Cell



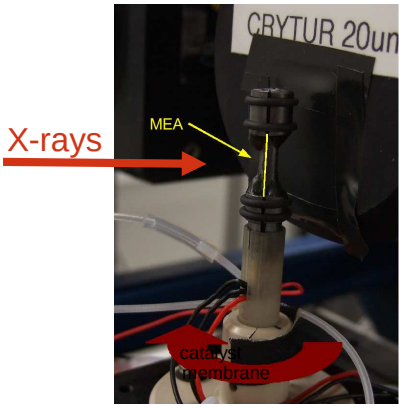
Fuel Cell Principle

Local Current Density

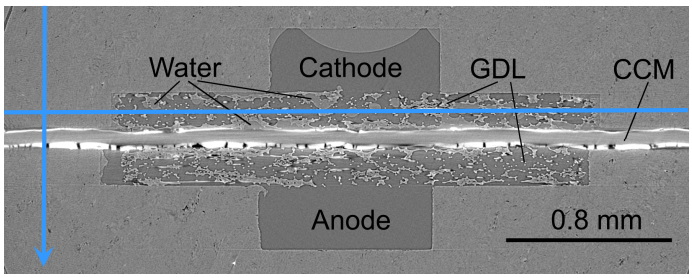


- Lack of understanding of the interaction of liquid water with the porous structures
- Need for characterization: in-situ in running cells
- X-ray microscopic tomography (XMT) provides **contrast** for **water** and **solid**, and adequate spatial **resolution** (1µm)

1. XTM obtaining gray scale data



Cell at endstation of TOMCAT beamline of SLS
1001 exposures
245 ms frame rate
4 min acquisition time



Horizontal XTM reconstruction slice through XTM PEFC

- Challenges: realistic operating of fuel cell in small field of view on rotation stage of beam line
  segmentation of gray scale XTM data

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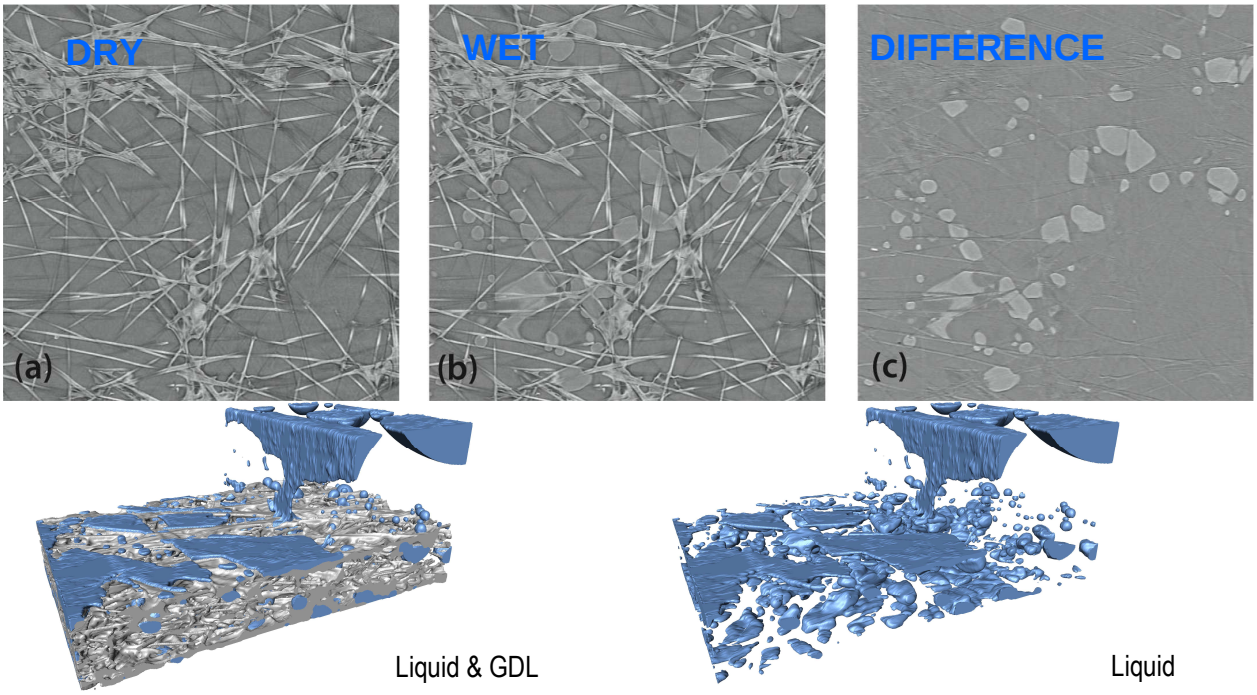
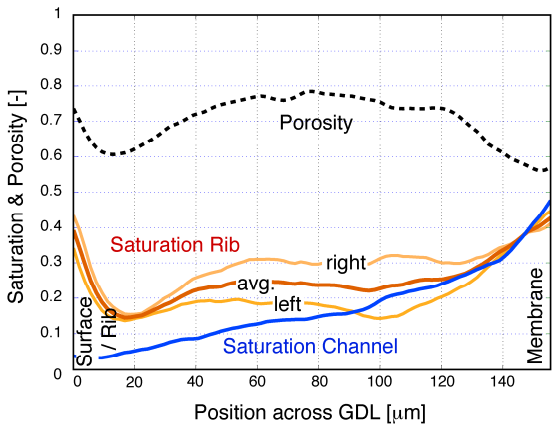
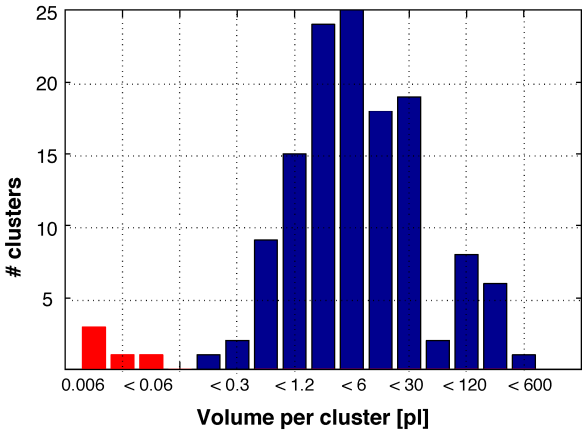
2. Phase segmentation

- Enhance liquid contrast by subtraction of wet – dry tomo data
- Segment solid, liquid and void phases
- Surface rendering of segmented data



3. Determine Quantitative Properties





Local saturations are an important property for modeling input.

Droplet size is a decisive parameter for the evaporation/condensation rates. sub-nl sizes can be determined. Droplet size distribution maximum correlates with pore size distr. maximum.

XTM allows for determination of quantitative in-situ GDL properties not accssible otherwise

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