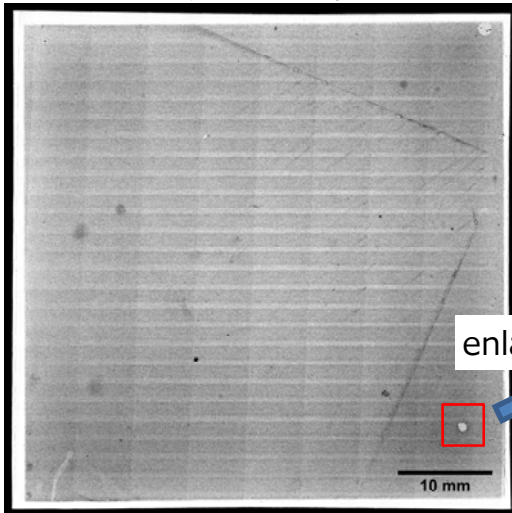


Structural evaluation of defects in PEFC catalyst layer by X-ray CT and SEM correlation microscopy in the meso-micro region

Toray Research Center introduced high sensitive SCMOS camera detector for soft X-ray microscope (XRM). By using XRM and X-ray CT, it became possible to investigate the process of catalyst layer defects, which is considered to be one of the reason of PEFC performance deterioration. "One-stop service" by correlation X-ray and scanning electron microscopy (X-ray CT & SEM) gave us the important structural informations.

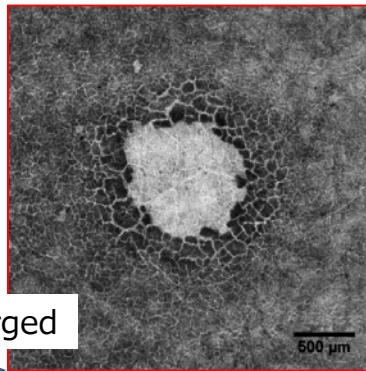
Observation of the whole image and defective part of MEA

X-ray microscope



5 cm × 5 cm Whole transmission image of MEA

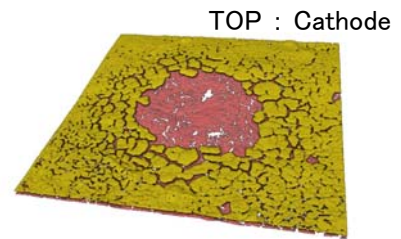
enlarged



resolution : about 1 μm
Found the internal defect by transmission image

X-ray CT (3D reconstruction image)

Remove GDL and MPL by image processing



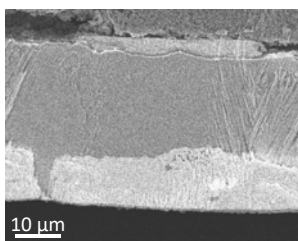
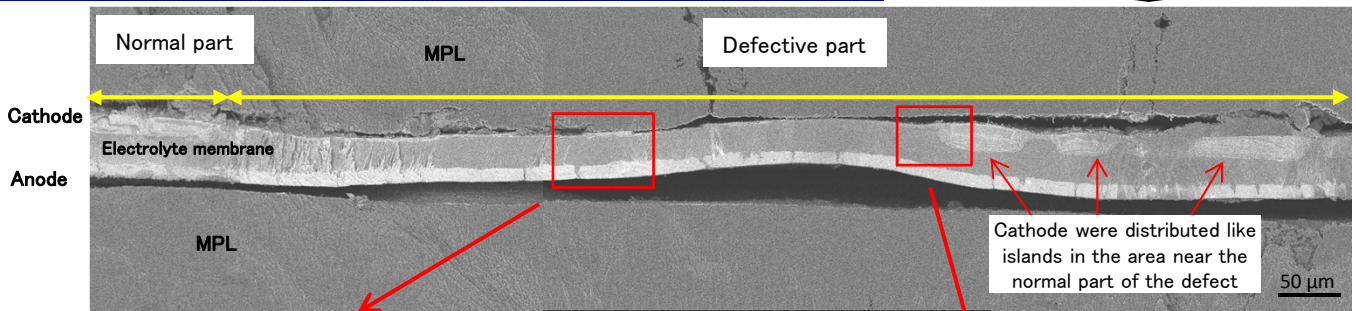
BOTTOM : Anode

Clarify where there was no cathode

Correlated X-ray CT with cross sectional SEM

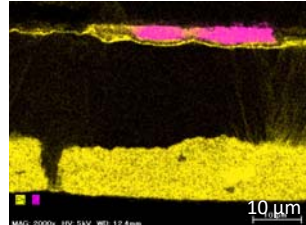
Cross-section processing of the defective part was carried out in a state where GDL and MPL were laminated and the defective part in cathode cannot be visually confirmed.

Cross-sectional SEM observation and SEM-EDX measurement of defective part

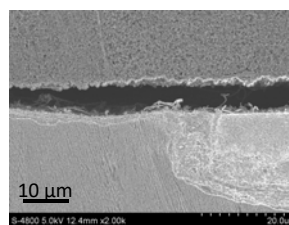


resolution: several nm

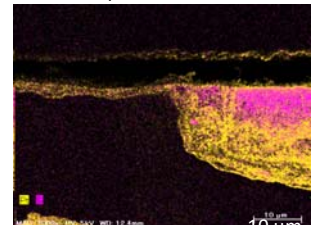
Pt + Si map (Yellow: Pt, Pink: Si)



resolution: dozen of nm



Pt + Si map (Yellow: Pt, Pink: Si)



- There were thin cathode remaining in defective part, confirmed the distribution of Si that were suspected of being mixed from outside, including in normal areas.
- The cause of the defect could be traced to the cause of the mixture of Si components.

The combination (correlation) of various microscopes makes it possible to clearly understand the structural changes in the meso-micro region!