Contribution ID: **75** Type: **Keynote**

Neutron imaging of polymer electrolyte fuel cells (PEFCs)

Monday 18 July 2016 14:00 (50 minutes)

Polymer electrolyte fuel cells (PEFCs) are efficient energy converters mainly foreseen as a replacement for internal combustion engines in mobility application (e.g. automobiles, buses). They use hydrogen as a fuel and allow the vehicles to be free of local CO2 and pollutant emissions, and the whole supply chain to be nearly CO2 neutral if the hydrogen is produced from renewable sources. Currently, first models are being put on the market, but the effective contribution to CO2 reduction will depend on the market penetration of this technology. In this context, an optimization of the PEFC technology in terms of costs is still highly desired. Besides the reduction of the material costs (e.g. membrane and platinum catalyst) per unit area, an increase of power density allows a reduction of the cell area for a specified power output, and thus contributes to the cost reduction. One of the important limiting factors for the power density is the accumulation of product water in undesired locations, which may have the further detrimental effect of reducing the cell lifetime.
In this context, in situ visualization of liquid water in operating fuel cells has attracted the attention of several researchers in the past 10-15 years. Among the different methods proposed (magnetic resonance imaging, x-ray radiography or tomography, optical imaging), neutron radiography bears the decisive advantage of allowing the imaging of relatively small thicknesses of water in fuel cells with no or minimal modifications, the fuel cell structural materials (e.g. aluminum or steel) being readily transparent for fuel cells.
In this talk, the use of neutron imaging in the past years will be presented through a series of examples including:
1) Conventional "through plane"imaging of large fuel cells
2) High resolution "in plane"imaging of downscaled cells
3) High throughput imaging of several cells at the same time
An outlook will also be given, in particular to discuss the boundaries between the application of neutron imaging and other techniques (e.g. x-ray imaging) in future applications. In this context, the combination of in situ imaging with advanced cell instrumentation will be presented.

Author: Dr BOILLAT, Pierre (Paul Scherrer Institut (PSI))

Presenter: Dr BOILLAT, Pierre (Paul Scherrer Institut (PSI))

Session Classification: Session I: Fuel Cells 1 (Chair: Olaf Holderer)

Track Classification: Energy storage & transformation