

# Seminar

Friday, August 3, 2018

2:00 pm

Room 66-110

## “Noble Metal Aerogels as Highly Durable Catalysts for Polymer Electrolyte Fuel Cell Applications”

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State-of-the-art polymer electrolyte fuel cells (PEFCs) require large amounts of carbon-supported platinum nanoparticle (Pt/C) catalysts ( $\sim 0.4 \text{ mg}_{\text{Pt}}/\text{cm}^2_{\text{geometric}}$ ) to account for the large overpotential of the oxygen reduction reaction (ORR). [1] These excessive Pt-loadings that impede widespread commercialization of PEFCs can be mitigated by increasing the catalysts' ORR activity, e.g. by alloying platinum with other metals like Ni, Cu and Co, to form materials which show up to one order of magnitude higher mass-specific activity than commercial Pt/C catalysts. On the other hand, state-of-the-art carbon-supported materials suffer from significant carbon and Pt corrosion during the normal operation of PEFCs, gradually compromising their performance. To partially overcome these stability issues, a lot of research effort is dedicated to the development of unsupported ORR catalysts. Among these materials, bimetallic alloy aerogels consisting of nanoparticles interconnected to nanochains [2] present an interesting option, since their extended 3D structure should facilitate transfer to actual PEFC cathodes.

In this talk, after having elucidated the high electrocatalytic activity of noble metal aerogels towards the ORR in model studies [3], the successful transfer of these catalysts into technical PEFC cathode environment will be presented demonstrating the practical applicability of these systems.

### References:

- [1] A. Rabis, P. Rodriguez, T.J. Schmidt, ACS Catalysis 2 (2013) 768-800
- [2] W. Liu, et al., Acc. Chem. Res. 48 (2015) 154-162
- [3] S. Henning, et al., J. Electrochem. Soc. 163 (2016) F1-F6



### CV: Prof. Dr. Thomas J. Schmidt

TJS is Professor and Chair for Electrochemistry at ETH Zürich and Head of the Research Division Energy & Environment at Paul Scherrer Institute. In addition, he is Director of the Swiss Competence Center for Energy Research (SCCER) Heat & Electricity Storage. After his PhD from University of Ulm, Germany, he pursued his career at Lawrence Berkeley National Laboratory, PSI, and in industrial Fuel Cell research (BASF Fuel Cell GmbH), before he moved to ETH Zürich and PSI in 2011. His work is focused on all aspects of electrochemical energy conversion and storage.