(Bi-)Metallic Aerogels for Electrocatalytic Applications

Maximilian Georgi, Justus Sebastian Diercks, Karl Hiekel, Albrecht Benad, Benjamin Klemmed, Piyush Chauhan, Juan Herranz, Thomas J. Schmidt, Alexander Eychmüller

Physical Chemistry, Technische Universität Dresden, 01069 Dresden, Germany

Electrochemistry Laboratory, Paul Scherrer Institut, 5232 Villigen, Switzerland

Maximilian.Georgi@chemie.tu-dresden.de

Abstract

Combining the properties of nanoparticles with a self-supported highly porous body makes metal aerogels excellent and promising candidates as catalysts, especially in electrochemistry. Previous work shows the capability of this relatively new class of materials for electrochemical reactions such as the oxygen reduction reaction (ORR), which is key to switch from fossil fuels to renewable energy. [1], [2]

In our work, we present a universal and stabilizer-free synthesis for such monometallic (e. g. Pd, Pt, Au, Cu and Co) as well as bimetallic gels (e. g. AuCu) in highly concentrated ethanolic solutions. This allows to synthesize the gels in one fortieth of the common reaction volume and to reduce the gelation time from several days to several hours (and up to a few minutes). Additionally, switching from water to ethanol as the solvent allowed us to perform the gelation at lower temperatures (-70°C), which opens up better kinetic control of the reaction. [3]

We will compare the as synthesized bimetallic AuCu gels with AuCu gels obtained from an aqueous approach with regard to their morphology, porosity and crystal phase as well as their electrochemical properties.

Literature:

[1] W. Liu, A.-K. Herrmann, N. C. Bigall et al. Acc. Chem. Res. 2015, 48, 154-162.
[2] S. Henning, H. Ishikawa, L. Kühn et al. Angew. Chem. Int. Ed. 2017, 56, 10707-10710.
[3] M. Georgi, B. Klemmed, A. Benad, A. Eychmüller, Mater. Chem. Front. 2019, 3, 1586–1592.

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