Colloidal synthesis approach for energy conversion electrocatalysts

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Colloidal synthesis is a promising approach for the preparation of supported and unsupported catalysts. For electrocatalytic energy conversion the catalysts are predominantly precious metal based. In the presented work, we investigate colloidal Pt and Ir catalysts for oxygen reduction and oxygen evolution, respectively. In particular we investigate redispersion and stability of iridium nanoparticles (IR-NPs) synthesized by an established ethylene glycol (EG) route [1]. The particles are precipitated from the synthesis suspension by acidic washing in order to observe „surfactant-free“ NPs. After particle separation from the solvent by centrifugation the NPs can be redispersed in different solvents. Focusing on the stability of these colloidal systems we analyze the influence of the use of different acids for the washing step. Traditionally 1M HCl is used for this step, which however is a well-known catalyst poison inhibiting catalytic reactions and promoting metal dissolution. Stable colloid systems are essential for their further use to prepare electrode structures for example via spray coating.

[1] Yuan Wang, Jiawen Ren, Kai Deng, Linlin Gui, Youqi Tang, Preparation of Tractable Platinum, Rhodium, and Ruthenium Nanoclusters with Small Particle Size in Organic Media, *Chemistry of Materials,* **2000**, 12, 1622-1627.