

NANOSCIENCE COLLOQUIUM

Wet Chemical Synthesis and Processing of Nanoparticles

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ABSTRACT: Wet chemical processes are at the heart of my laboratory's research activities. From the synthesis of inorganic nanoparticles to their processing and application in energy storage and conversion, they play a decisive role in whether a material or device ultimately fulfills its function. In this talk, I will introduce the non-aqueous sol-gel synthesis of metal oxide nanoparticles and selected formation mechanisms that allow, at least to some extent, rational planning of the synthesis of a given nanomaterial. Nevertheless, unexpected reactions occasionally occur in such syntheses, which in our case lead to interesting materials suitable for corrosion protection and heating fabrics. Strategies are proposed to assemble the nanoparticles into three-dimensional porous networks that, after supercritical drying, result in aerogel monoliths with macroscopic sizes. Careful selection of the nanoscale building blocks allows subtle tuning of the compositional and morphological properties of the aerogels depending on the application. As an example, the use of metal-metal oxide composite aerogels in the photocatalytic reforming of methanol in the gas phase will be presented.

