

演 題 : ”Liquid-Phase Synthesis Particles, Films and
Composites in Organic Solvents”

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場 所 : 工学部材料化学棟 MC201

Abstract: Liquid-phase routes to inorganic functional materials in organic solvents are nowadays a well-established and flexible alternative to aqueous methods, offering advantages such as high crystallinity, well-defined and uniform particle morphologies, control over the surface chemistry, and robust and reproducible synthesis protocols [1]. A special feature of these nonaqueous routes is that organic reactions provide the “monomers” for the nucleation of the inorganic products, and thus particle formation can simply be monitored by studying the organic chemistry.

The talk will give an overview of nonaqueous synthesis routes to various inorganic materials such as metal oxides, metal sulfides and metal phosphates, together with a discussion of selected chemical formation mechanisms. It will be shown how the use of microwave irradiation greatly accelerates the organic and inorganic processes, offering an efficient tool to prepare powders, nanoparticulate films and doped materials within just a few minutes [2]. Some of these compounds can be applied in lithium ion batteries [3] and in chemoresistive CO₂ sensors [4]. Finally, a modular approach to prepare multicomponent aerogels by self-assembly of preformed nanoparticles will be presented [5].

References:

- [1] M. Niederberger, N. Pinna, *Metal Oxide Nanoparticles in Organic Solvents: Synthesis, Formation, Assembly and Application*, Springer-Verlag London Limited, **2009**
- [2] I. Bilecka, M. Niederberger, *Microwave Chemistry for Inorganic Nanomaterials Synthesis*, *Nanoscale* **2010**, 2, 1358.
- [3] I. Bilecka, A. Hintennach, M. D. Rossell, D. Xie, P. Novak, M. Niederberger, *Microwave-Assisted Solution Synthesis of Doped LiFePO₄ with High Specific Charge and Outstanding Cycling Performance*, *J. Mater. Chem.* **2011**, 21, 5881.
- [4] I. Djerdj, A. Haensch, D. Koziej, S. Pokhrel, N. Barsan, U. Weimar, M. Niederberger, *Neodymium Dioxide Carbonate as Sensing Layer for Chemoresistive CO₂ Sensing*, *Chem. Mater.* **2009**, 21, 5375.
- [5] F. J. Heiligt, M. D. Rossell, M. J. Süess, M. Niederberger, *Template-free Co-Assembly of Preformed Au and TiO₂ Nanoparticles into Multicomponent 3D Aerogels*, *J. Mater. Chem.*, in print

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