Czech Chemical Society Lecture
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University Campus Bohunice, Kamenice 5, Building A11 / room 132

Airborne Preparation of Porous Microsphere Catalysts

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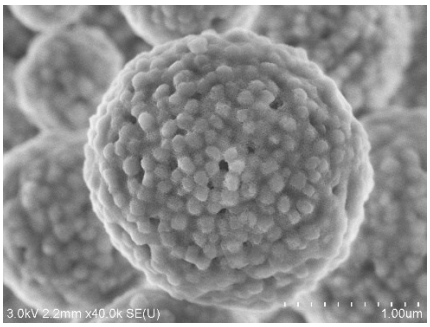
The technical features of aerosol processes make them alluring for the continuous, large scale, and tailored production of divided nanomaterials, and in particular of advanced heterogeneous (nano)catalysts.[1] Aside from the common aggregation of preformed particles via spray drying (or atomization), reactive aerosol processes allow synthesizing tailored-made catalysts with tunable surface properties, textures, compositions, surface functionalities, etc. In the "aerosol-assisted sol-gel" process (AASG), the inorganic polycondensation reactions are confined in small droplets and happen in seconds. This is exploited to kinetically quench the system far away from the thermodynamically stable configuration. In addition, sol-gel reactions can be coupled with the evaporation-induced self-assembly (EISA) concept. This allows producing micronic or submicronic, inorganic or hybrid organic-inorganic particles bearing tunable and calibrated porous structures at different scales. Here, we explain why this peculiar mode of preparation has led to high-performance solid nano-catalysts in various applications including olefin metathesis, glycerol upgrading, olefin epoxidation, and dehydrogenation.[2-5] In particular, we show how the method offers an excellent control over homogeneity, dispersion, surface functionalities, and texture. We will also demonstrate the concept of chemo-enzymatic heterogeneous catalysts obtained via spray techniques.[6] Our objective is to illustrate the tremendous possibilities offered by the coupling between bottom up sol-gel routes and aerosol processing technologies, which will arguably represent a major route of innovation not only in the field of catalyst preparation, but also more broadly in the mushrooming nanotechnology field.



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