Design of hierarchical SCALMS systems via spray-drying

S. Wintzheimer[1]

[1]Department of Chemistry and Pharmacy, Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany

E-Mail presenting author: susanne.wintzheimer@fau.de

In the last 15 years, nanoparticles have been considered as building blocks[1] to create more complex particulate units from them, *i.e.* supraparticles. Supraparticles not only conserve nanoparticulate properties and lift the overall particle sizes to the microscale range but also provide additional functionalities exceeding the sum of properties of their constituent building blocks.[2] Concerning supraparticles for catalysis, this for example means providing beneficial coupling between the supraparticle components or an emerging inner porosity of the catalyst material.[3] Supraparticles can consequently provide nanoparticle-based catalytic activity and serve at the same time as support material. This permits the creation of complex catalytic materials with enhanced activity, selectivity, or stability.[4]

In this talk, the tunability of spray-dried supraparticles regarding their pore structure and catalyst distribution within the support matrix is highlighted[5]. Furthermore, their high potential as hierarchical SCALMS (Supported Catalytically Active Liquid Metal Solutions) systems is demonstrated (Figure 1).[6]

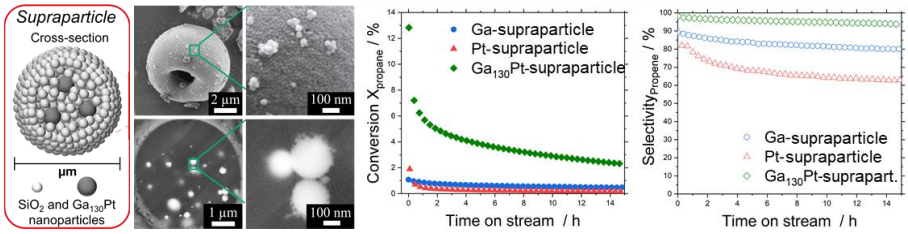

Figure 1: Scheme and scanning electron micrographs showing the composition of $Ga_{130}Pt$-SiO_2 supraparticles, as well as the conversion and selectivity for $Ga_{130}Pt$- in comparison to Ga- and Pt-SiO_2 supraparticles in propane dehydrogenation.[6]

[1] S. C. Glotzer, *et al.*, Nature Mater, 2007, **6**, 557, 10.1038/nmat1949
[2] S. Wintzheimer, *et al.*, ACS nano, 2018, **12**, 5093, 10.1021/acsnano.8b00873
[3] S. Wintzheimer, *et al.*, Adv. Funct. Mater., 2021, **31**, 2011089, 10.1002/adfm.202011089
[4] S. Wintzheimer, *et al.*, Adv. Mater., 2023, **35**, 2306648, 10.1002/adma.202306648
[5] P. Groppe, *et al.*, Small, 2024, 2310813, 10.1002/smll.202310813
[6] T. Zimmermann, *et al.*, Mater. Horiz., 2023, **10**, 4960, 10.1039/d3mh01020a