

ICB PhD public presentations

HIERARCHICAL AND POROUS ASSEMBLIES OF POLYACRYLONITRILE NANOPARTICLES FOR CO₂ CAPTURE AND CATALYSIS

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HCI H 2.1, 13.00 h

Project Summary: Merging polymer and colloidal sciences permits the synthesis of a new kind of materials with hierarchical structure and different porosity. In addition to macropores among the nanoparticles, micropores can be introduced inside each individual nanoparticle by a well-defined heat treatment, thus creating a bimodal porous system adequate for effective material transport. By choosing to work with polyacrylonitrile (PAN), nitrogen is present inside the material without any need of post-synthesis doping, thus facilitating the acid-base interaction necessary for efficient CO₂ capture. This highly porous graphene-like material is thermally and mechanically very strong and could be also used as carbon-based support for catalysis. For this purpose, palladium- or platinum-precursors were incorporated during the polymerization process using different approaches and resulting in different spatial distributions within a single PAN nanoparticle. The metal is thus embedded inside the polymer matrix without any leaching. Targeting hydrogenation and coupling reactions, Pd-based PAN was thermally treated and microporosity was introduced without any aggregation of the noble metal, hence proving the stability of Pd on PAN support. Finally, this new stable and highly porous catalyst was tested on several reactions.

CV. Anna Beltzung did her Bachelor and Master in chemical engineering at ETH Zurich. She joined the group of Prof. Morbidelli as a PhD student in March 2014.