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MORPHOLOGY CONTROL OF POROUS POLYMERIC MATERIALS VIA PRIMARY PARTICLE ARCHITECTURE

Alberto Cingolani
ICB Morbidelli Group
Supervisor: Prof. Dr. Massimo Morbidelli
Co-examiner: Prof. Dr. Lucio Isa

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Project Summary: Porous polymeric materials with peculiar morphologies can be obtained via reactive gelation. Colloidal polymer nanoparticles, swollen by additional monomer and initiator, are destabilized and aggregated in controlled way, forming porous networks, which can be hardened by post-polymerization through heating. Playing with the aggregation kinetics and regime (i.e., electrolyte addition or shear-induced) enables the production of porous polymers in different forms, such as monoliths, particles and hollow shells. As the primary nanoparticles are the building blocks of these materials, it is of high interest to explore the effect of their features on the resulting structures. Indeed, thanks to their characteristics, such as advanced functionality, composition or core/shell architecture, a reliable control on the final pore size distribution is accessible. Thanks to this knowledge, peculiar materials have been produced: one is a base scaffold for chromatographic application, which, in comparison to current commercial resins, exhibits not only extremely low-pressure drops even at very high flow rates, but also flat HETP profile for tracers in size range of common bio-macromolecules. The other consists of robust hollow microcapsules, with tunable surface porosity and permeability.

CV. Alberto Cingolani was born in 1990 in Milan, Italy. He obtained a Bachelor's Degree in Chemical Engineering at Politecnico di Milano in 2012 and a Master's Degree in Chemical and Bioengineering at ETH in 2014. Afterwards, he joined the group of Professor Morbidelli for his PhD studies.