

# Functional Colloidal Mesostructures: From Optics to Thermal Transport

**Prof. Dr. Markus Retsch**  
Physical Chemistry I  
University of Bayreuth, Germany

Self-assembly is a powerful tool to access well-defined nanostructured materials, which exhibit unique mechanical, optical, or thermal properties. When working with colloidal latex or silica particles structural length scales from a few tens up to few micrometers can be addressed.

I will present our latest results on the self-assembly process and nanostructured material fabrication itself. I will introduce a new way to fabricate colloidal gradient structures and elaborate on their emerging properties, for instance, as time-temperature integrating sensors. The interplay between order and disorder in mesoscopic structures has a significant influence on the photonic, phononic, and thermal transport properties. I will outline these along with structurally similar examples of binary colloidal ensembles. In the last part, I will focus on thermal transport in nanostructured materials. Here, the materials classes will also include 1D fibre structures and 2D clay hybrid systems. In particular, I will outline how to engineer highly insulating materials, but also which role anisotropy plays in heat transport.



**Brief Curriculum Vitae** Markus Retsch studied Polymer and Colloid Chemistry at the University of Bayreuth (2001 – 2006) and graduated in 2006 with a diploma thesis in the group of Prof. A. H. E. Müller. He then moved to the Max-Planck-Institute for Polymer Research in Mainz to conduct his Ph.D. thesis in the group of Prof. W. Knoll. There he worked on colloidal assembly structures under the supervision of Prof. Jonas, with research stays at FORTH, Heraklion, Crete. In 2009, Prof. Retsch received his Ph.D. from the Johannes Gutenberg University in Mainz. He then spent 2.5 years as a postdoc at the Massachusetts Institute of Technology, MIT in Cambridge, MA, USA working with Prof. E. L. Thomas. In August 2012, Prof. Retsch was appointed Juniorprofessor for Polymer Systems at the University of Bayreuth. In 2013 he received a Lichtenberg professorship from the Volkswagen Foundation and in 2016 an ERC starting grant. Since 2018 Prof. Retsch holds the chair for Physical Chemistry I at the University of Bayreuth. He is the deputy spokesperson of the CRC1585 MultiTrans. His research interests lie in the investigation of materials for energy conservation and conversion, accessible by colloidal assembly strategies.

