

Supracolloidal Polymer Structures through Interface-Driven Assembly

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We use interface-driven assembly of colloids as a tool to fabricate supracolloidal structures. In this talk we will highlight our work on the preparation of armored and mechanically reinforced supracolloidal structures, on various length scales. We will discuss the concept of solids stabilized (mini)emulsion polymerization as a route for the preparation of complex multi-layered hybrid colloidal structures, the use of liquid-liquid interfaces as an assembly tool to prepare a range of micron-scale structures including templating strategies to achieve monodisperse assemblies, non-spherical assemblies, and supracolloidal hollow silica-based structures with nano-scale templated hollow patterns.

Moreover, we will report on two different approaches to use interface-driven assembly of colloids as versatile strategies to prepare cellular materials. These materials are light-weight as they show a very high porosity, typically $> 80\%$, resembling cellular natural objects such as sponges, bone, and wood. We will show that we can control the properties of our cellular supracolloidal materials by variation of the building blocks from which the individual supracolloidal units have been build, and by use of different scaffolding techniques, such as radical polymerization of the continuous phase and using the excluded volume effect in confined spaces. It is our belief that our approach widens the window of the design of cellular materials and has scope to deliver exciting innovations in areas such as chromatography, cell storage, catalysis and sensors/detectors.