Colloidal nanoparticles offer a range of interesting optical and electronic effects. A prominent example is the localized surface plasmon resonance (LSPR) of metal nanoparticles due to resonant excitations of vibrations of the particles’ free-electron cloud by light. Due to the LSPR, plasmonic nanoparticles provide excellent means for controlling electromagnetic near-fields at optical frequencies, which has led to a broad range of applications in various field such as surface enhanced spectroscopy, light harvesting or photonics.

While much research is dedicated to understanding nanoparticle synthesis and tailor their LSPR on the single particle level [1], ordering particles on surfaces opens another powerful avenue towards optical and electronic functionality. Plasmonic particles can couple locally, altering their LSPR, but as well collective long range phenomena can give rise to novel effects. In this context, methods for ordering particles that are scalable to macroscopic areas are of great interest.

We discuss, how biomimetic approaches can contribute to solving this technological challenge. In particular we focus on controlled wrinkling as a versatile means for surface patterning and its application in template assisted self assembly [2]. We discuss the underlying physico-chemical effects and perspectives for applications in Surface Enhanced Raman Spectroscopy and Photonics, as well as approaches towards tuning of plasmonic coupling effects by mechanical strains.

References