

Versatile large area alignment of anisotropic nanoparticles in layer-by-Layer assembled films for plasmonics



Matthias Pauly

Institut Charles Sadron, CNRS-Université de Strasbourg, France

Recently there has been great interest in developing materials that could control the flow of electromagnetic waves in unprecedented ways. In particular, metal nanoparticles are particularly interesting due to their surface plasmon resonance. Metallic self-assembled nanoparticle arrays have numerous potential applications such as Surface-Enhanced Raman Spectroscopy (SERS), plasmon-enhanced fluorescence or on-chip waveguiding. In particular, significant progress has been made in the area of nanowire and nanorods synthesis and device application in the past several years.[1] A big challenge, however, still resides in the hierarchical organization of these nanoscale building blocks into functional assemblies and ultimately a useful system. Discovering new bottom-up methods to assemble one-dimensional nanomaterials into two- or three-dimensional structures with well-controlled location, orientation, and spacing across multiple length scales has attracted lots of attention, owing to the potential applications in electronic and optical devices.[2]

I will present a novel technique we have developed for the self-assembly of anisotropic nanoparticles as mono- and multilayer thin films. It allows aligning anisotropic nano-objects on large areas with tunable particle density and orientation. Furthermore, the Layer-by-Layer assembly technique[3] is used to build multilayer thin films in which each layer architecture and orientation can be controlled independently. With this, helical assemblies of metallic nanorods and nanowires can be prepared. The optical properties as function of the thin film geometry will be detailed, with a special emphasis on oriented mono- and multilayers and on helical plasmonic superstructures, which display very high chiroptical activity.

- 1) P. R. Sajanlal et al., *Nano Rev.* **2011**, 2, 5883.
- 2) L. Xu et al., *Chem. Soc. Rev.* **2013**, 42, 3114-3126.
- 3) G. Decher et al., *Science* **1997**, 277, 1232-1237.