Julius-Maximilians-
UNIVERSITÄT
WÜRZBURG

Kolloquium der Physikalischen und Theoretischen Chemie

Dienstag, 05.07.2016 **Hörsaal D, Chemiezentralgebäude, 17:15 Uhr**

Sprecher: Andreas Fery

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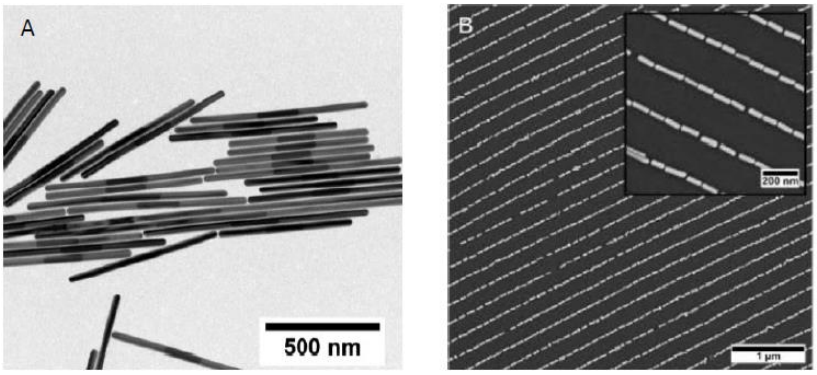
Titel: Bridging from nano- to macro-scale in plasmonics

Abstract:



A: Well-defined Ag/Au nanorods with tuneable shape and spectroscopic response [1]
B: Ordered assemblies of nanorods up to macroscopic areas [2]

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, plasmonic light harvesting or optical metamaterials. Self -assembly of metallic nanoparticles offers an attractive route for fabricating well-defined plasmonic structures, since nanoparticles can be synthesized with well-defined crystallinity and assembly processes can be up-scaled to macroscopic dimensions. Thus, the step from nanoscopic particles to macroscopic functional ensembles becomes feasible.

While much research is dedicated to understanding nanoparticle synthesis [1] and optimization for these tasks, understanding formation of supra-colloidal assemblies and unravelling their structure-property relations is still in its infancy. We discuss different assembly routes for the formation of well-defined supra-colloidal structures like linear assemblies [2], nanoparticle-clusters and 3-dimensional ordered systems [3]. It turns out, that interfacial templating effects are a powerful tool for controlling particle order with nanoscale precision. We discuss the underlying

physico-chemical effects and perspectives upscaling to macroscopic areas as well as perspectives for applications in Surface Enhanced Raman Spectroscopy and optical metamaterials.

[1] Mayer, M.; et al. Controlled Living Nanowire Growth: Precise Control over the Morphology and Optical Properties of AgAuAg Bimetallic Nanowires. *Nano Letters* **2015,** *15*, 5427-5437.
[2] Tebbe, M.; et al. Optically Anisotropic Substrates via Wrinkle-Assisted Convective Assembly of Gold Nanorods on Macroscopic Areas. *Faraday Discussions* **2015,** *181*, 243-260.Hanske, C.; et al. Strongly Coupled Plasmonic Modes on Macroscopic Areas via Template-Assisted Colloidal Self-Assembly. *Nano Letters* **2014**, 14 (12), 6863 - 6871. Pazos-Perez, N.; et al. Highly uniform SERS substrates formed by wrinkle-confined drying of gold colloids. *Chemical Science* **2010,** *1* (2), 174-178.
[3] Pazos-Perez, N.; et al. Organized plasmonic clusters with high coordination number and extraordinary enhancement in surface-enhanced raman scattering (SERS). *Angew. Chem. Int. Ed.* **2012,** *51* (51), 12688–12693; Alba, M.; et al. Macroscaled plasmonic substrates for highly sensitive SERS. *Angew. Chem. Int. Ed.* **2013,** *52* (25), 6459–6463.

Organisation: T. Hertel

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