How to tune optical properties of porous gold nanoparticles?

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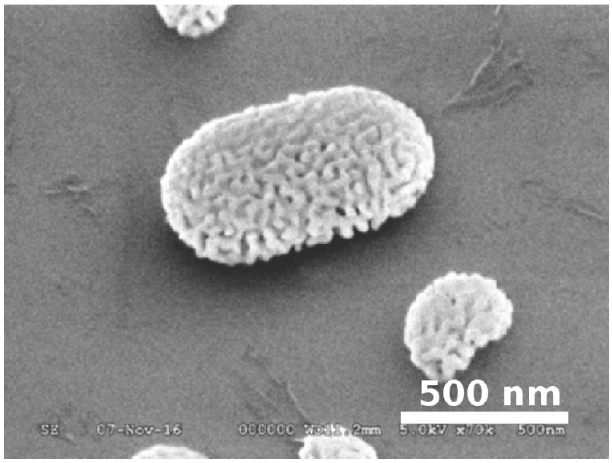
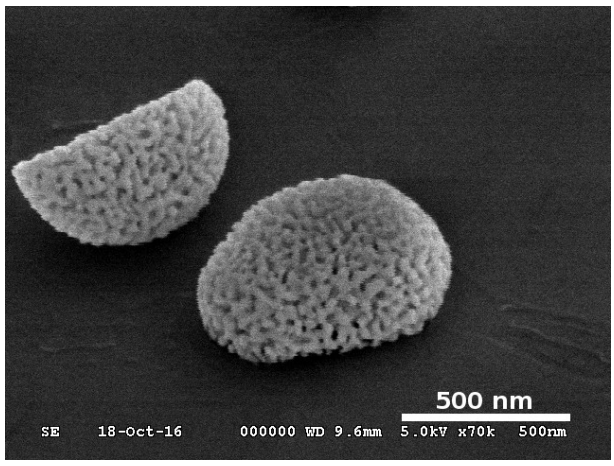
Porous gold nanoparticles are very popular due to their high surface/volume ratio, moreover they have stronger plasmonical properties than their solid counterparts. These properties makes porous gold nanoparticles very useful for lots of applications, for instance chemical sensors, cancer therapy applications. Porous gold nanoparticles were fabricated on SiO_2/Si as well as sapphire by solid dealloying and dewetting methods. According to our knowledge, the most appropriate method to cover a 3D nanostructure with a thin (5-7 nm) metal-oxide layer is Atomic Layer Deposition (ALD) method. It is well-known that the surface of porous gold nanoparticles can be passivated with a thin metal-oxide (alumina[1] or titania [2]) layer, which results good thermal stability of the nanoporous morphology. Our intention was to investigate the influence of alumina-titania-mixed coatings, and compare it the previous findings of alumina and titania coated porous gold nanoparticles.
Samples were coated with mixed alumina-titania oxide layer using plasma-enhanced ALD method. Coated particles were annealed for an hour in air at different temperature from 350°C up to 900°C. Changes of the morphology, as well as optical extinction spectra were measured in a wide wavelength range.
In this presentation we will show how the different alumina-titania ratio influences the morphology as well as the optical properties of porous gold nanoparticles.





References:
[1] A. Kosinova, D. Wang, E. Baradács, B. Parditka, T. Kups, L. Klinger, Z. Erdélyi, P.Schaaf, E.Rabkin (2017) : Tuning the nanoscale morphology and optical properties of porous gold nanoparticles by surface passivation and annealing, **Acta Materialia 127, 108-116**
[2] L.Juhász, B.Parditka, C.Cserháti, S. S. Shenouda, Z.Erdélyi : Fabrication and investigation of porous gold nanoparticles passivated with TiO_2 layer (in progress)