# Bottom-Up Nanofabrication of Supported Noble Metal Alloy Nanoparticle Arrays for Plasmonics - DTU Orbit (08/11/2017)

## Bottom-Up Nanofabrication of Supported Noble Metal Alloy Nanoparticle Arrays for Plasmonics

Mixing different elements at the nanoscale to obtain alloy nanostructures with fine-tuned physical and chemical properties offers appealing opportunities for nanotechnology and nanoscience. However, despite widespread successful application of alloy nanoparticles made by colloidal synthesis in heterogeneous catalysis, nanoalloy systems have been used very rarely in solid-state devices and nanoplasmonics-related applications. One reason is that such applications require integration in arrays on a surface with compelling demands on nanoparticle arrangement, uniformity in surface coverage, and optimization of the surface density. These cannot be fulfilled even using state-of-the-art self -assembly strategies of colloids. As a solution, we present here a generic bottom-up nanolithography-compatible fabrication approach for large-area arrays of alloy nanoparticles on surfaces. To illustrate the concept, we focus on Au-based binary and ternary alloy systems with Ag, Cu, and Pd, due to their high relevance for nanoplasmonics and complete miscibility, and characterize their optical properties. Moreover, as an example for the relevance of the obtained materials for integration in devices, we demonstrate the superior and hysteresis-free plasmonic hydrogen-sensing performance of the AuPd alloy nanoparticle system.

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