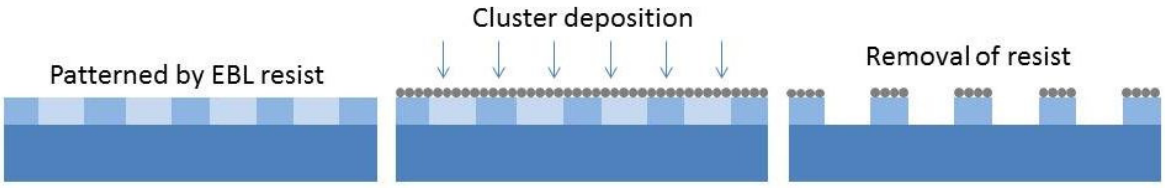
Formation of Arrays of Supported Metal Nanoparticles

Arrays of metal nanopraticles will be fabricated by combining electron beam lithography (EBL) and cluster beam deposition techniques. The substrates will be patterned using standard technique for mask preparation. Metal (copper or silver) clusters will be produced using magnetron sputtering and then collimated into a beam for deposition on the surface, i.e. forming supported nanoparticles. After the deposition the resist will be etched to get ordered patterns of nanoparticles.



Particles of coinage metals are of practical interest due to the phenomenon related to collective oscillation of valence electrons leading to localizied surface plasmon resonance (LSPR). LSPR causes specific absorption band in the optical spectra. Parameters of the band can be controlled by tuning metal species, particle size, arrangement of nanoparticles and dielectric environment. These will be studied experimentally using atomic force microscopy for the characterization of the arrays and transmittance optical spectroscopy for detecting LSPR. The samples with ordered arrays of metal nanoparticles have potential application in plasmonics.

The project will include following items.

1. Overview and analysis of literature on metal clusters (nanoparticles) and their properties with focus on LSPR.
2. Getting knowledge and skills on EBL, vacuum cluster beam technique and deposition of nanoparticles.
3. Getting practical experience in use of atomic force microscopy and optical spectroscopy.
4. Study and characterization of fabricated structures.

Thus, the project will deep your knowledge in atomic and solid state physics, surface science, optics, modern trends in nanotechnologies as well as experience in several methods of physical characterization.

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