Cluster ion implantation and deposition

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General:
The Cluster Ion Beam subject covers a wide range of topics from fundamental studies of effects on energetic cluster ion impact with surfaces to application oriented deposition of atomic clusters.
By obtaining a fundamental understanding of the dynamical properties of clusters it will be possible to use this class of objects to develop Cluster Ion Beam Processing as a powerful technology for the production of materials with novel functional and structural properties on nanoscale.

Experimental facilities:

**CIDA** - an ultrahigh vacuum Cluster Implantation and Deposition Apparatus.
The apparatus consists of implantation, load-lock, connection chambers and manipulator. CIDA is designed and built to realise cluster ion beam facilities, in particular to manipulate clusters produced by the attached sources and provide appropriate conditions for deposition and implantation.

**PUCLUS** - a PUIsed CLUster Source from gaseous precursors compatible with the CIDA. PUCLUS is based on pulsed valve for supersonic expansion (E.L.-5-HRR-2011). The source allows to produce clusters from various gaseous precursors. The source is equipped by the ionizer. Time-of-flight mass spectrometer in Willey-McLaren configuration (located in CIDA) gives a possibility for size selection of the produced clusters. They can also be post-accelerated up to ca. 20 keV.
The source is currently under the optimization of working parameters.

**MaSCA** – a Magnetron Sputtering-based Cluster Apparatus compatible with the CIDA. MaSCA is based on commercial gas condensation source NC200U (Oxford Applied Research Ltd.). The source is capable to produce clusters from different metals. Electrostatic quadrupole mass spectrometer (QMS) allows for size selection of the clusters. The source was successfully tested for production of copper and silver clusters.
Main research directions:
- fundamental studies of the dynamical behaviour occurring on energetic cluster ion impact with surfaces (using PUCLUS);
- fundamental and applications oriented investigations of metal cluster deposition (using MaSCA), in particular towards formation of plasmonic nanosystems and use them for biosensing.

Publications (since 2011)