

Ph.D. Course in Materials Science and Nanotechnology

University of Milano-Bicocca, Department of Materials Science, via Cozzi 55, 20125 Milano

February 19, 2020 – 11.00 a.m.

Seminar room - Department of Materials Science U5

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Tailored Nanoparticles Prepared in Superfluid Helium Droplets

By doping superfluid droplets of 10^6 to 10^{10} helium atoms (HeN) with foreign atoms or molecules, cold complexes of atomic or molecular species are formed that can either be investigated by molecular beam spectroscopic methods or deposited on solid substrates for surface analysis. In this way, large Cu, Ag, Au, Ni, Co, Fe, Pd, Cr, or V_2O_5 aggregates of different morphology have been generated and deposited on solid carbon, h-BN, or SiN substrates. Employing different pick-up cells for doping the droplets, core-shell clusters of 3 to 6 nm diameter with one metal surrounding a core of a different species are produced. After surface deposition, the samples are removed and various measurement techniques are applied to characterize the created particles: scanning electron microscopy at atomic resolution, electron tomography, temperature dependent SEM and TEM up to 1000 degree C, energy-dispersive x-ray spectroscopy (EDXS), electron energy loss spectroscopy (EELS) and optical absorption. By varying the contents of different metals in core-shell particles, we can tune the plasmon resonance. Results of our investigation of the thermal behavior of deposited nanoparticles and the corresponding phase changes and chemical reactivity on the nanoscale will be reported. Vanadium oxides represent a prominent materials class for catalytic applications. On the way towards cluster catalytic experiments, we have shown that V_2O_5 nanoparticles can be generated by sublimation from the bulk and deposited while keeping the original stoichiometry.

PhD students and all interested in the seminar are kindly invited to participate.

The PhD Coordinator
Prof. Marco Bernasconi