Molecular Dynamics and Cluster Formation in Superfluid Helium Droplets

By

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Host: Assoc Prof Claus-Dieter Ohl

Abstract

Superfluid droplets of $10^4$ to $10^9$ helium atoms (He$_n$) are doped with foreign atoms or molecules that move freely in or on the droplets and may form complexes in this cold environment. In this way, alkali and alkaline earth metal atoms were observed to react and form mixed diatomic molecules that in the future may also be produced from ultracold atoms in traps.

By the same method, large Cu; Ag, Au, and Ni aggregates of different morphology are generated and their landing on a solid substrate was modelled in a molecular dynamics simulation. Nanowires and core-shell clusters with one metal surrounding a core of different kind were observed, deposited on solid substrates, and analyzed by high resolution electron microscopy and tomography. As it turns out, the temperature of the substrate and the doping rate have an important influence on the final cluster or wire structure. Our systematic studies help to provide recipes for the creation of tailored nanoparticles.

A brief survey will be given on other projects in my group addressing electron-nuclear coupling phenomena in molecules and semimetals.

Short Biography

Education:
Year 1983 -Habilitation - Freie Universität Berlin (Germany)(thesis topic: high resolution molecular spectroscopy)

Academic and Professional Appointments
Since 2002 - Ordinary Professor, Institute of Experimental Physics, Technische Universität Graz

Latest Honors and Awards
Year 2015 - Forschungspreis des Landes Steiermark (the Research Prize of Styria/Austria)

Research:
Molecular spectroscopy, molecular beams, clusters, superfluid helium droplets, atomic and molecular interactions on surfaces, nonlinear optics, plasma spectroscopy, gas laser development. About 175 refereed publications, 73 plenary or invited lectures at international conferences, about 320 other conference contributions, about 135 invited seminars and colloquia.