MAT Ionenstrahlworkshop 2025
September 22-24, 2025 at GSI, Darmstadt

Contribution ID: **93** Type: **Poster**

Ion beam shaping of catalytic nanoparticles

Monday, September 22, 2025 6:15 PM (10 minutes)

At the nanoscale metals exhibit catalytic properties that differ from those in the bulk phase. Gold, which is commonly regarded as inert, becomes a powerful catalyst for reactions such as the water gas shift reaction, which is an important step in the production of hydrogen. The catalytic activity depends on the size and shape of the metallic nanoparticle.
We explore the shaping of ligand-protected Au and AuCu alloy nanoparticles with ion beams and their resulting catalytic behavior, both with simulations and experimentally. SDTrimSP-3D was used to simulate the erosion of spherical nanoparticles by sputtering. Experimentally, samples of 10nm AuCu particles were irradiated with different fluences of low energy Ar ions and analyzed using atomic force microscopy. The resulting images show clusters of nanoparticles turning into single nanoparticles as the rest is sputtered away. Subsequently, these modified samples will be measured with scanning electron microscopy to determine the exact shape of the individual sputtered nanoparticles. The ion-beam-shaped particles will also be tested against the as-deposited nanoparticle shape in catalysis experiments using the water gas shift reaction.

Author: WRATHALL, Sophie (TU Wien)

Co-authors: Prof. COMAS VIVES, Aleix (TU Wien); KLAMPFL, Daniela (TU Wien); Dr PRATS GARCIA, Hector (TU Wien); SOTO RODRIGUEZ, Itzi (TU Wien); Prof. BARRABÉS RABANAL, Noelia (TU Wien); Prof. WILHELM, Richard Arthur (TU Wien)

Presenter: WRATHALL, Sophie (TU Wien)

Session Classification: Posters

Track Classification: Annual Workshop on Ion and Particle Beams (Ionenstrahl Workshop)