

Contribution ID: 119

Type: **Poster**

Functional Gold Nanowire Networks

Monday, September 22, 2025 7:15 PM (20 minutes)

This work presents the synthesis and functional characterization of three-dimensional (3D) Au and Au-Ag alloy nanowire networks fabricated using ion-track nanotechnology. This approach allows precise control over nanowire diameter (40–200 nm), alloy composition (10–90% Ag), and network porosity (20–98%). Selective removal of Ag atoms yields hierarchical porous nanowires with tunable ligament size and interconnected geometry.

The catalytic performance of Au nanowire networks was evaluated in methanol oxidation reactions. Their 3D structure and large electrochemically active surface area resulted in peak current densities up to 200 times higher than flat electrodes, with excellent stability over repeated cycles. These results highlight the nanowire networks as robust and tunable systems for porous catalysis and direct alcohol fuel cell applications.

In addition, wettability studies revealed a transition from hydrophilic to hydrophobic behavior with increasing porosity. Super-hydrophilicity was observed at intermediate porosities, while highly porous structures displayed the rose-petal effect. Such control over wetting states opens opportunities for applications in liquid transport, microfluidics, and sensors.

Author: LI, Mohan (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI))

Co-authors: ULRICH, Nils Max (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI)); Ms SCHÄFER, Michelle (Technical University of Darmstadt); Dr BONART, Henning (Institute for Nano- and Microfluidics, Technical University of Darmstadt); Mr ZELLNER, Daniel (Technical University of Darmstadt); Mr HENKELMANN, Gideon (Institut für Werkstoffphysik und Werkstofftechnologie, Technische Universität Hamburg); SCHUBERT, Ina (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI)); TRAUTMANN, Christina (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI)); TOIMIL MOLARES, Maria Eugenia (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI))

Presenter: LI, Mohan (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI))

Session Classification: Posters

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