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Microfluidic synthesis supply new insights into properties and behavior of metal and composite nanoparticles

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Metal nanoparticles attract a lot of interest due to their electronic and optical properties, but uniform physical properties can only be expected if the size, shape and composition of particles are homogeneous. Microfluidic techniques allow to generating colloidal solutions of differently shaped and constructed nanoparticles with very high yield and homogeneity. The spectral properties of their colloidal solutions allow to improving the understanding of their physical properties and their growth and aggregation behavior. It was found that electrical charges, electrostatic interaction, electrochemical processes and mixed potential formation as well as self-polarization and enhanced charging and polarization due to attachment and mobility of poly ionic macromolecules play key roles in nanoparticle formation. In result, homogenous colloids of simple spheres, core/shell particles, nanorods, Nano cubes, nanotriangles of metals as well as spherical, ellipsoidal, Dumbell like, branched, astragal- and flower-like polymer nanoparticles and different metal/polymer composite particle types have been obtained. The mechanisms of their formation and application in particle-based SERS-sensorics and flow catalysis will be discussed.

Speaker Biography

J. Michael Köhler is the head of the Department of Physical Chemistry and Micro Reaction Technology at the Technical University of Ilmenau (Germany) since 2001. He studied Chemistry in Halle an der Saale and Jena, where he also habilitated in General and Physical Chemistry (1992). He led a research department at the Institute of High Technologies in Jena between 1991 and 2001. During this time, he also taught at the Universities of Wuppertal and Jena. Professor Koehler inter alias has edited books on microlithography, micro system technology and nanotechnology. His current research interests are focussed on nanotechnology, on application of droplet-based microfluidics in nanoparticle syntheses and bio screenings and on physicochemical aspects of sustainable chemistry.

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