

Fabrication of Nanomaterials: Which, How, and Why?

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This seminar will be focused on the fabrication of various nanomaterials using electrospinning, ultrasound, microwaves, novel RAPET (Reactions under Autogenic Pressure at Elevated Temperature) techniques, and the study of fascinating properties of these nanomaterials. Four topics will be discussed: 1) non-conventional electrospinning for the fabrication of continuous conducting gold wires; 2) the application of ultrasound in the coating of optical [Au, Ag], magnetic [air-stable Fe], fluorescent [Eu₂O₃] nanomaterials on the variety of surfaces [silica, carbon, titania]; 3) microwave superheating phenomena for the fabrication of 1D [TiO₂, SnS] nanomaterials; and 4) recently developed RAPET approach for the synthesis of superconducting [MgB₂, MgNiC₃] nanoparticles, high surface area carbides [SiC nanorods, WC nanotubes], inorganic fullerenes-like [WS₂, WSe₂], solar cell [TiO₂, ITO] and storage [V₂O₅@C, SnS] materials. Unique properties, such as significant lowering of the melting point of nanogold (<180°C), induced crystallization of silica, high intra-grain critical current density in MgB₂ nanocrystals, 10% negative magnetoresistance in fullerene like Ni@C nanostructures, 2.5 wt % hydrogen storage in SiC nanorods, highest magnetization of air stable Fe, and stabilization of metastable tetragonal phase of ZrO₂ forming *in-situ* carbon shell will be demonstrated.