

Solvothermal hot injection AgNi nanoalloy preparation

Vít Vykoukal¹, Jiří Buršík², Pavla Roupcová², Jiří Pinkas^{1*}

¹ Masaryk University, Faculty of Science, Department of Chemistry, Kotlářská 2, 611 37 Brno, Czech Republic

² Institute of Physics of Materials, ASCR, Žitkova 22, 616 62 Brno, Czech Republic

jpinkas@chemi.muni.cz

Chemical synthesis of nanomaterials is a very progressive field of study. Preparation of nanoalloys is a challenging task due to their chemical, phase, and morphological variability. Nanoparticles of metal alloys exhibit many interesting properties, such as depression of melting point,^{1,2,3} plasmon resonance^{4,5}, magnetism, and catalytic activity. For nanoalloys preparation, the solvothermal synthesis, specifically in oleylamine is highly advantageous.^{6,7} Hot injection technique should ensure homogeneous conditions for nanoparticles nucleation and growth.

AgNi nanoparticles were prepared by injection of an oleylamine solution (4 cm³) of AgNO₃ and Ni(acac)₂ (different ratios, 4 mmol total amount) to a mixture of oleylamine (16 cm³) and octadecene (20 cm³) at 230 °C. After 10 minutes, the reaction mixture was cooled down to room temperature in a water bath. Then 20 cm³ of acetone was added and the mixture was centrifuged. Acetone was added to increase the yield. The precipitate was washed by a mixture of hexane and acetone (1:3 volume ratio). This procedure was repeated twice and finally the precipitate was dispersed in hexane and characterized.

Dynamic Light Scattering (DLS), Transmission Electron Microscopy (TEM), and Small-Angle X-ray Scattering (SAXS) analyses were carried out for determination of average size, size distribution, and shape of prepared nanoparticles. Obtained results were mutually compared. Thermal behavior was characterized by Differential Scanning Calorimetry (DSC). Plasmon resonances were observed and we found out that the intensity of plasmon resonance was dependent on the molar ratio of AgNi in the particles.

References

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