Synthesis of Ni core NiO shell nanostructure and magnetic investigation for shell thickness determination

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Nickel oxide has received a considerable amount of attention in recent years for its catalytic, electronic and magnetic properties.

Ni nanoparticles with an average size of 8 nm were prepared by dc – arc discharge in argon atmosphere. A current of 130 A and 300 milibar pressure of argon have been applied. The produced Ni nanoparticles were annealed for oxidizing in air at 350 for six hours to produce antiferromagnetic NiO particles.

The structure of Ni and NiO nanoparticles and size estimation of them studied by means of X-ray diffraction. The size and morphology of the particles were also characterized by high resolution transmission microscopy (TEM).

The Nicore NiOshell structure, resulting from the oxidation process, were studied by magnetic properties measurements. A quantum design squid magnetometer, model MPMS5S was used for measuring saturation magnetization of both nanoparticles of Ni with and without NiO layer. By knowing the density of Ni and NiO, we were able to deduce the thickness of the Ni core and NiO outer layer. They are around 3 and 5 nanometers respectively.

The influnce of electron and ion irradiation on gold nano particles morphology for hybrid polymer solar cell

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Using transmission electron microscopy the influence of low energy electron and ion post irradiation on gold nano particles morphology on silicon monoxide films are investigated. It is shown that electron irradiation increase mean size 10 nm of gold nano particles by stimulation of migration coalescence and ion irradiation decrease mean size 5 nm by stimulation of secondary nucleation from sputtered gold nano particles. Pronounced differences in the influence of electron and ion irradiation for simulation of nano particles and polymer morphology compatibility for hybrid solar cell were observed. The electron irradiation produces larger nano particles that are homogeneous in size. The ion irradiation does same, but with rings of smaller nano particles surrounding of large ones. The ion bombardment generate sputtering of larger nano particles with re-deposition of sputtered atoms on preferred adsorption sites and secondary nucleation leads to decreasing of nano particles mean size . The electron bombardment leads to charging of nano-particles and dielectric substrate with stimulation of migration coalescence. Using optical microscopy imprint data the air electron irradiation stimulated compatibilization of nanoparticle-polymer films are investigated. It is shown that low dose electron post irradiation leads to decreasing of surface micro hardness.