RESPONSE OF SURFACE MORPHOLOGY IN COBALT-FULLERENE MIXTURE FILMS UPON VARIATION OF THE METAL CONTENT

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Abstract

Formation of the organometallic composites, built of metal and fullerene, is a challenging subject, which promises a number of new compounds and nanostructures for advanced technologies. However, origin of the phase composition formed in the metal-fullerene systems (except the alkali metal-fullerene systems) during the material fabrication is not well understood as usual due to complex chemical interplay between the metal and C60. The latter is regarding also to the cobalt-fullerene system which demonstrates attractive magnetic properties and giant magnetoresistance. On the other hand, knowledge about relation between the material composition and nanostructure is still insufficient. In the present research we contribute to this topic applying atomic force microscopy (AFM) for distinguishing possible effects of phase transitions in the Co-C60 mixture films caused by variation of the mixture composition. The CoxC60 mixture films (0 x < 50) with thickness of about 60÷70 nm were fabricated on Si(001) substrate using the method of simultaneous deposition under the carefully controlled deposition conditions. The film composition was estimated by quartz monitor and verified by Rutherford backscattering spectroscopy. The AFM imaging of the film surface were carried out with the NTEGRA microscope. The analysis of the AFM images revealed remarkable correlation between the film surface morphology and composition of the hybrid film. Thus, variation of surface roughness allowed us to evaluate the critical concentration which separates the homogeneous and heterogeneous regions of the composition as well as to discuss the strain effects detected in the mixture at higher metal content.

Keywords: Fullerene, Cobalt, Nanocomposite, Deposition, Atomic Force Microscopy

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