Nanostructured surfaces

Thickness and interface dependent structural, magnetic and transport properties of Cu/Co thin film and multilayer structures

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Recently, in the growth of sensor and other magneto-electronic applications, the immiscible system Co/Cu has an appropriate giant magnetoresistance (GMR) effect, continues to be of special interest [1]. Co/Cu multilayers exhibiting appreciable GMR have been studied widely and there are some reports on the dependence of GMR on factors like number of bilayers [2], thickness of individual Cu-layers [3] and Co-layers [4] and interfacial roughness [5]. Thus, in the present paper, we have systematically characterized the structural, magnetic and transport properties of electron beam evaporated Co/Cu thin film and multilayer structures (MLS) having different layer thicknesses utilizing XRD, MOKE and resistivity techniques. The structural studies show distinctive crystal structures for different sub-layer thicknesses. The Co (300 Å) single layer film is amorphous, while Cu (300 Å) film is nanocrystalline in nature. The average particle size is found to decrease as the number of interfaces increase keeping aggregate thickness steady. The corresponding magnetic and resistivity measurements demonstrate an increment in saturation field and resistivity as an aftereffect of enhanced anisotropy. However, coercivity decreases with decrease in particle size. The results presume that these properties are greatly impacted by various micro structural parameters such as layer thickness, number of bilayers and the quality of interfaces molded under distinctive growth conditions.

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