Comparative study of alternated and codeposited Fe-Co grown on Cu$_3$Au(001)

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Epitaxial growth of magnetic thin films on substrates with different lattice parameter leads to a structural distortion that can changes significantly their magnetic properties. The magnetism can also be affected by the chemical composition, the film thickness and surface/interface interactions [1,2]. It has been theoretically shown that a tetragonal distortion induced by the substrate can lead to a giant perpendicular magnetic anisotropy (PMA) of Fe$_{1-x}$Co$_x$ alloys for specifics compositions [3,4]. In this work we have investigated the structural and magnetic properties of Fe/Co alternate monolayers (up to 7 ML) and FeCo alloys (3, 4 and 5 ML) grown on Cu$_3$Au(001). The structure and morphology were characterized in-situ by STM, LEED and RHEED measurements and the magnetism was analyzed by longitudinal and polar MOKE. STM results indicated that the film growth was very similar for alternate and codeposited films, both presenting the same morphological characteristics. However, a different magnetic behavior was observed when comparing films with the same thicknesses. Our results indicate that the chemical ordering induced by the alternate monolayer deposition is decisive on determining the magnetic properties.

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