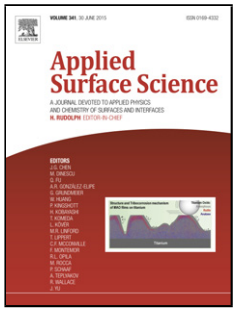

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Epitaxial Growth of Ultrathin MgO Layers on Fe_3O_4(001) Films

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The initial growth stages of MgO on Fe_3O_4 films are studied by means of x-ray photoelectron spectroscopy and low energy electron diffraction to clarify stoichiometric and structural properties of these layered structures. This bilayer structure is important to fabricate high quality magnetic tunnel junctions based on Fe_3O_4 electrodes and MgO tunnling barriers. For this purpose, the deposition temperature of MgO has been varied between 100°C and 250°C. Initially, MgO grows layer-by-layer on Fe_3O_4/MgO(001) forming a wetting layer. Depending on the growth temperature, after growth of a 2-3 nm thick laminar wetting layer, the MgO films finally start to roughen during growth. Thus the growth of MgO on Fe_3O_4/MgO(001) is described by a Stranski-Krastanov growth mode. Diffraction experiments show that the magnetite $(\sqrt{2} \times \sqrt{2})$R45° superstructure is removed already during the initial stages of MgO deposition. Furthermore, these experiments show that the MgO film are rougher for growth at low deposition temperatures.

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Keywords: ultra thin films, x-ray photo electron spectroscopy, XPS, low energy electron diffraction, LEED, MgO, magnetite, Fe_3O_4, Stranski Krastanov growth mode, tunneling barrier

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