Characterization of magnetic iron and nickel vapor deposited films

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Abstract

We prepared several samples of pure Fe and Ni films, evaporated in high vacuum conditions onto Cu foils or mica, ranging in thickness between 50 and 300 nm and measured their magnetization near the critical point in a protective atmosphere. The value of the T_c for the films thinner than 200 nm, grown on Cu, resulted lower than the respective bulk T_c Further, for these films the magnetization decreases linearly with temperature near T_c . Films of Ni grown on mica do not show a shift in T_c relative to bulk Ni. The bulk saturation magnetization is obtained for Fe and Ni films grown onto mica at relative low fields (45 G) while on the films grown onto Cu more than 300 G are needed to obtain the bulk magnetization value. Characterization of the films with scanning electron and transmission microscopy, X-ray photoelectron spectroscopy, X-ray diffraction and Auger depth profiling was performed. These analyses indicate that the films initially are of good quality but heating them up to the transition temperature promotes interdifussion of the films with the Cu substrate.