Ultrathin iron nitride films on Cu(001): Growth conditions vs. structure and electronic properties

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Iron nitrides exhibit interesting magnetic and electronic properties, making them promising for spintronic applications [1,2]. We studied ultrathin ($\leq$ 1 monolayer-thick) γ'-Fe_4N films grown on Cu(001) by sputtering the substrate with N^+ ions, depositing Fe and post-annealing in ultra-high vacuum (UHV). The relatively small lattice mismatch between the iron nitride and the copper support (in the $\sqrt{2}$ direction) results in an epitaxial growth [3]. In addition to the films prepared using the above-mentioned (and already-reported [4–5]) procedure, we also prepared iron nitride layers using the modified approach in which we switched the order of the preparation steps (Fe deposition$\rightarrow N^+$ sputtering$\rightarrow$UHV annealing). The results obtained using scanning tunneling microscopy (STM) and spectroscopy (STS) revealed differences in the structure (islands vs. continuous film) and electronic properties (work function, density of electronic states close to the Fermi level) of the films, which is believed to be related to the growth of either a pure γ'-Fe_4N (using the literature procedure) or a half-unit-cell Fe_2N form (using the modified approach).

References:

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