SEMINAR
Institute for Advanced Materials, Devices and Nanotechnology (IAMDN)

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Hydrogen induced structural changes in thin metallic films

Abstract: Thin metallic films are used as coating, for catalysis and as conductors in integrated circuits. There is a lot of interest concerning the effect of hydrogen on the properties of thin metallic films from both applied and fundamental aspects. Using a combined X-ray diffraction and residual resistivity measurements we have shown fully reversible and nondeteriorating first-order phase transformation in thin vanadium films. In addition to the bulk like first-order $\alpha \rightarrow \beta$ transformation, two additional reversible second-order transitions exist in the film. We have also studied the effect of hydrogen on FeV alloy thin films. Ab initio calculations based on density functional theory (DFT) predict two ordered stable ground states, Fe$_3$V and FeV$_3$, whereas a disordered $\sigma$-phase is reported under ambient condition. Using hydrogen, the formation of ordered structures has been proved by a reversible decrease of the electrical resistivity with increasing hydrogen pressure. A kinetic study of the resistivity changes under hydrogen supports the phase transformation anticipated process.