

Preparation and characterisation of Ce/Fe multilayers

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Ce/Fe multilayers (MLs) with constant Fe (2 nm) and variable Ce sublayer thickness were prepared onto naturally oxidised Si(100) substrates using UHV magnetron sputtering. Chemical purity of the sublayers was revealed in-situ by X-ray photoelectron spectroscopy (XPS). The structure of the samples was studied by standard low- and high-angle X-ray diffraction (XRD). Surface morphology of the samples was examined by atomic force microscopy. Magnetic properties of the MLs were studied in the temperature range between 5 and 350 K using a vibrating sample magnetometer in a magnetic field up to 9 T. Furthermore, hydrogen absorption and desorption kinetics up to 1000 mbar was studied at room temperature (RT) in Pd covered MLs using four-point resistivity measurements. The solid state amorphisation reactions have been confirmed by XRD and magnetic measurements in the “as-deposited” Ce/Fe MLs. The absence of satellite peaks in the low-angle XRD patterns revealed no artificial layered structure. The above results show that interdiffusion of cerium and iron atoms is extremely fast at RT.