High energy photoelectron spectroscopy combined to x-ray standing waves to study Pd/Y multilayers

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We use hard x-ray photoemission spectroscopy (HAXPES) combined with x-ray standing waves to characterize a series of Pd/Y multilayers designed to work in the 7.5-11 nm range. The samples, prepared by magnetron sputtering, are deposited either with or without nitrogen introduced in the sputtering gas or with or without a thin B4C barrier layer. The aimed period of the samples is 4 nm. The experiments consist in obtaining the core level spectra of the various elements for a series of grazing angles. The angular scan is made in the range given by the Bragg law, the multilayer period and the incident photon energy. Owing to the period of the multilayer and the presence of a 2.5 nm-thick capping layer, the photon energy is chosen to be 10 keV in order to probe the first 5-6 periods of the stack. Thus the Bragg angle is a little less than 1°. Rotating the sample enables putting the nodes of the electric field at some particular location of the stack, thus to make the excitation depth-selective, coming from one interface or another or from the center of one given layer. The changes of the chemical shift in the Pd 2p and 3d, Y 2p and 3d, N 1s, C 1s and B 1s as a function of the angle, that is to say as a function of the location in the stack will give information about the possible interfacial process taking place in the Pd/Y multilayers.