

# XPS valence band studies of $\text{LaNi}_{5-x}\text{M}_x$ (M = Al, Co) alloy thin films

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$\text{LaNi}_{5-x}\text{M}_x$  (M = Al, Co) alloy thin films were prepared onto oxidised Si(100) substrates in the temperature range 285–700K using UHV magnetron co-sputtering. The surface chemical composition and valence bands of all the alloy thin films were measured in-situ, immediately after deposition, transferring the samples to an UHV analysis chamber equipped with XPS. Structural studies showed that the samples deposited at 295K are nanocrystalline with average grain size  $D \sim 15\text{-}20$  nm. Thin films deposited at about 700K are polycrystalline with  $D \sim 200$  nm. XPS results showed that the shape of the valence bands measured for the polycrystalline samples is practically the same compared to those obtained theoretically from ab-initio band structure calculations. On the other hand, the XPS valence bands of the nanocrystalline  $\text{LaNi}_{5-x}\text{M}_x$  thin films are considerably broader compared to those measured for the polycrystalline samples. This is probably due to a strong deformation of the nanocrystals. Therefore, the different microstructure observed in polycrystalline and nanocrystalline alloy thin films leads to significant modifications of their electronic structure.