ESRF	**Experiment title:** Study of interfacial mixing in Au/Ni (111) multilayers by means of Diffraction Anomalous Fine Structure	**Experiment number:** SI-289
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Most of the unusual properties of metallic multilayers are related to their interfacial structure. We are performing a detailed analysis of strains and structure in Au/Ni multilayers. These samples are made by MBE in SP2M/DRF in Grenoble CENG. The Cu(100) buffer grown on Si(100) leads to a (111) orientation of the multilayer. From the analysis of the out of plane interplanar distances we have been able to extract the stress and

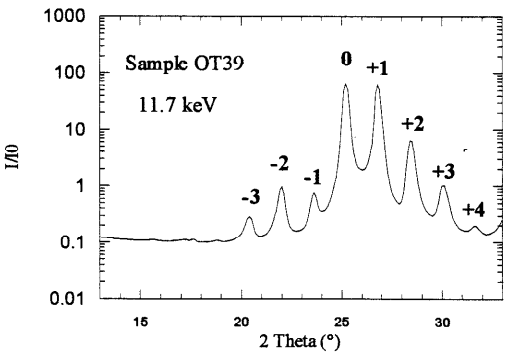

Figure 1: Selected diffraction spectrum for multilayer OT39 (A = 4 nm, Au :Ni = 3 : 1)

the stress free cubic lattice parameter in Au and in Ni. Whereas the stress free lattice parameter is equal to the bulk one for Au, the Ni parameter is strongly expanded with respect to the bulk Ni parameter. This expansion is the largest for the thinner films. We attribute this Ni lattice expansion to Au insertion caused by dynamic segregation during the growth. This would then provoke a concentration gradient close to the interface as a result of a competition between segregation and deposition rate. In summary one should expect a concentration and a strain gradient at the Ni on Au interface. In order to check this hypothesis and analyse in details the inter-facial structure we have performed Diffraction Anomalous Fine Structure experiments close to the Au LIII edge. In this kind of approach one combines two types of experiments namely diffraction and XAFS in order to extract a site and atom selective local information. Two different type of multilayers have been studied with the same superperiod (A = 4 nm) but different Au :Ni thickness ratios(3 :l and 1 :3). Anomalous diffraction has been performed between 11.7 and 12.7 keV. A typical diffraction spectrum is given in Figure 1 for sample OT39 (Au :Ni = 3 :1). DAFS spectra have been recorded on the different satellites (see fig. 2 for a typical spectrum). All this data calls for a detailed refinement in order to get the concentration and strain gradients at the interfaces. In a first step we are performing a refinement on the anomalous diffraction spectra. The oscillatory part will be taken into account in a second step. Additional measurements will be performed at the Ni K edge in order to improve the quality of the refinement.

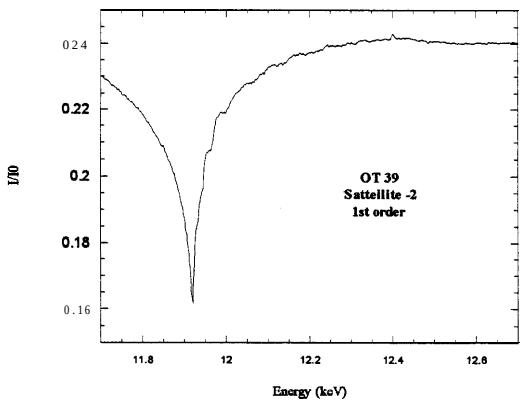

Figure 2: Intensity of diffraction line (–2) as a function of incident photon energy.