ESRF	**Experiment title:** Nanometric thickness PtxCol-x alloy on Pt(I 11): structural study of the different metastable phases	**Experiment number:** Si - 202
Beamline: BM32	**Date of experiment:** from: 1l/12/96 to: 17/12/96	**Date of report:** 27/2/97
Shifts: 18	**Local contact(s):**	*Received at ESRF:* 02 MAR. 1998

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Report:

The UHV diffractometer of the French CRG-IF beam-line, diffraction and EXAFS measurements can be 'realised during the growth and/or during annealing: the sample holder allows to play with the beam polarisation by flipping the sample from vertical to horizontal, the temperature substrate and the the flux of Pt and Co evaporation sources are computer controlled.

Metastable PtCo ultrathin superficial alloys on a Pt(111) substrate

Pt-Co alloys grown along the (111) direction have received much attention as promising candidates for high density magneto-optic recording. owing to strong perpendicular magnetic anisotropy and increased Kerr rotation effect. Several works on "thick" fiims (20-30nm) obtained by codeposition. tend to prove the presence of a new ordered phase with a predominant role on magnetic properties: this ordered phase would be characterised by sequences of Pt rich / Co rich planes, but in a different way from the well known $L1_2$ and $L1_0$ bulk ordered phases. To understand this behavoiur, we have developed our work in two directions: 1) we have first studied ultrathin alloy films, obtained by annealing a few layers of Co deposited on a Pt(111) substrate .at room temperature, 2) we then turned to the first steps of growth of alloys by codeposition on Pt(111), at variable temperatures.

<u>1) Annealing of Co deposit grown at room temperature on Pt(111)</u>

Upon annealing, the Pt concentration of the surface film increases going through different surface alloy metastable phases. In the case of 3 Co monolayers (ML), the kinetics, starting at 200°C, exhibits 3 regimes before diffusion. which are observed along line 1 in lscans (fig. la) and kscans (fig. Ib) : (1) 220°C to 330°C (alloy film thickness increasing from 3 to 5 ML), (2) 330°C to 410°C (5 to 7 ML) and (3) above 420°C (>7 ML). The overall vanishing of the trace of the Pt rod, along line 2 (fig.. lb), as the annealing temperature T increases. reveals a more and more diffuse interface but with an intensity modulation showing a cyclic smooching of the interface for thicknesses of 5 and 7 layers. The intensity oscillations along non-specular alloy rods indicate an homogeneous allov except for 2 layers. Annealing of-6 and 10 Co ML have been also studied to investigate the effect of the Cd deposit thickness on the metastable states and their kinetics. Let us mention that we have observed superstructures in the final state of these systems compatible with the $L1_2$ structure of the bulk ordered phases.

2) PtCo grown by coevaporation on Pt(111) at variable temperature

Contrarily to the previous surface alloy (annealing of Co film grown at room temperature), diffraction measurements show that the alloy stoichiometry does not change during annealing until 450°C and no trace of the usual bulk alloy ordered phases has been observed. SEXAFS measurement was performed on $Pt_{25}Co_{75}$ (12 ML thick) grown at 200°C, at Co-K edge for polarisation parallel and perpendicular to the surface sample. Detection in current mode is achieved by dynodes electron multiplier, which was made by **A.** Mougin and 0. Ulrich. Moreover SUV diffractometer motion allow to get rid of the glitches in EXAFS spectra due to the sample diffraction. A significant dichroism is observed in the experimental spectra showing that Co atom environment is anisotropic.

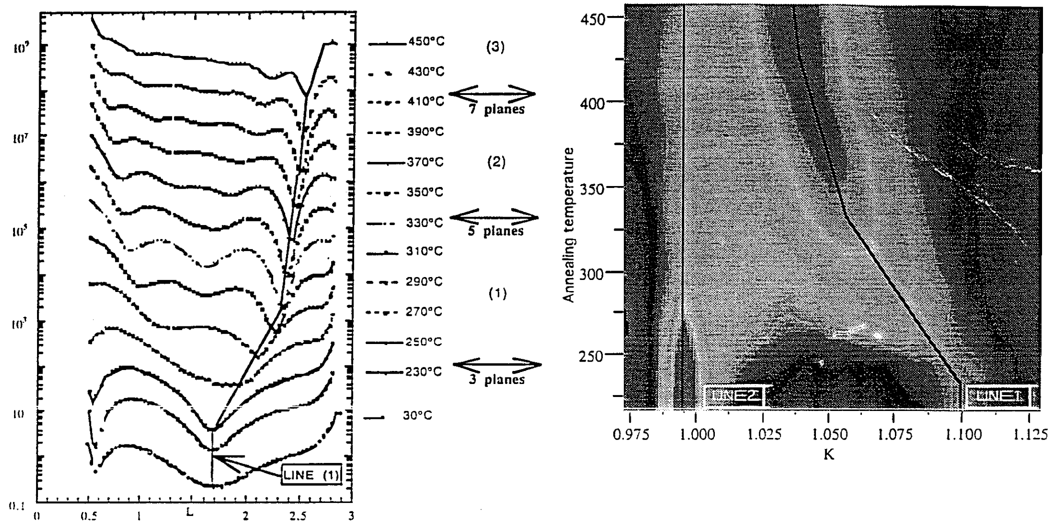

Fig 2 : a) Diffracted intensity along the <00l> direction (lscans), the oscillations (related to the surface alloy thickness) present a significant signature of a plane by plane spreading of the alloy in the Pt substrate.

b) Diffracted intensities measured along the <0k0.6> direction (kscans) at each annealing temperature T and are gathered to build this image. Each kscan presents 2 peaks. The first (1) is due to the surface alloy film Pt_xCo_{1-x}, its position depends on x and it shifts from the Co position, k=1.1, for T<220°C towards the Pt one. The other (2), at k=1, is the trace of the surface Pt substrate rod.