ESRF	**Experiment title: Interface structure propagation through transition metal multilayers**	**Experiment number**: SI-961
Beamline: BM28	**Date of experiment**: from: 8.10.03 to: 14.10.03	**Date of report**: 26.5.04
Shifts: 18	**Local contact(s)**: Simon Brown	*Received at ESRF:*

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Report:

We have used the MAR 2-dimensional CCD detector on BM28 at the ESRF to record the out-of-plane diffuse scatter for series of multilayers with varying numbers of repeats (Fig 1). We have demonstrated that the data quality from the 2D detector is comparable to that taken serially with a scintillation detector (Fig 2) but is recorded in a small fraction of the time, a full scattering pattern being recorded in typically 10 seconds. The diffuse scatter associated with the first three Bragg sheets has been measured for different values of grazing incidence angle. The evolution of the correlated roughness morphology with number of repeats has been studied. For sputtered Co-Ru, the FWHM in q_z of the 1st Bragg sheet initially rises very slowly, increasing more rapidly at about a q_y value of $0.03Å^{-1}$. At high q_y values, the FWHM, which is proportional to the inverse of the out-of-plane correlation length, obeys a scaling law (Fig 3). The exponent itself varies with stack thickness according to a power law (Fig 4). The intensity of the 1st Bragg Sheet integrated in q_z, as a function of q_y also shows power law dependence at high q_y (Fig 5). We are presently comparing the Co-Ru data with that taken

from sputtered Co-Pd multilayers and testing the exponents derived with those predicted by key growth models.

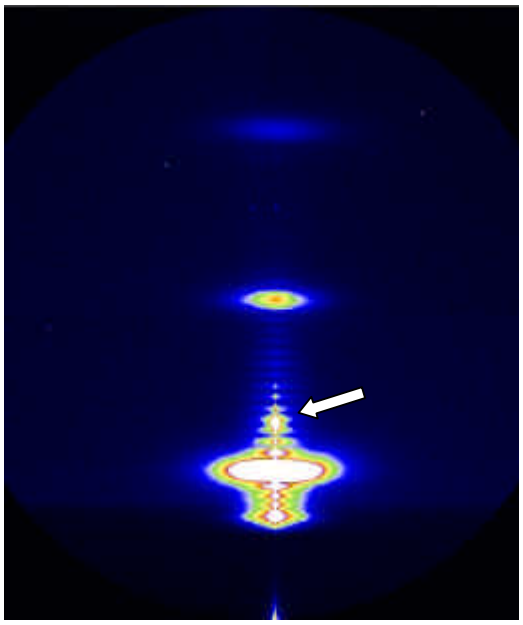

Figure 1. Diffuse scatter from a sputtered Co/Ru multilayer recorded on the MAR CCD detector at BM28 at the ESRF. Arrowed point is the only specular scatter. Data collection time 10 sec.

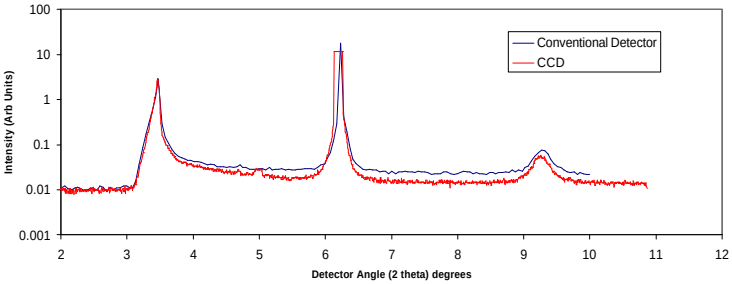

Figure 2. Comparison of MAR and scintillation detector data

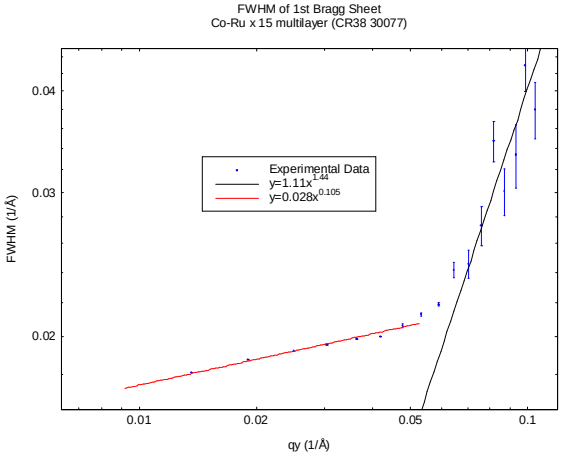

Figure 3. Variation in q_z FWHM as a function of q_y

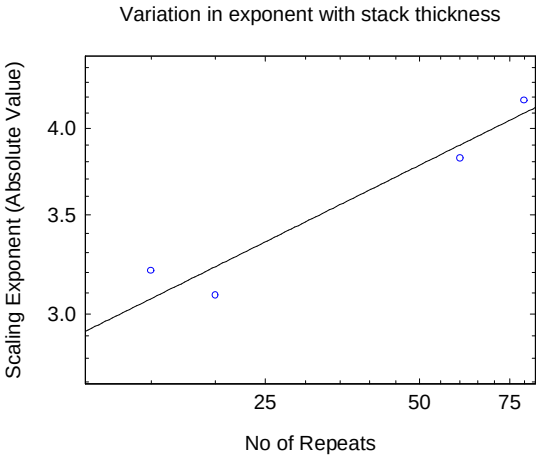

Figure 4 Scaling exponent as a function of thickness

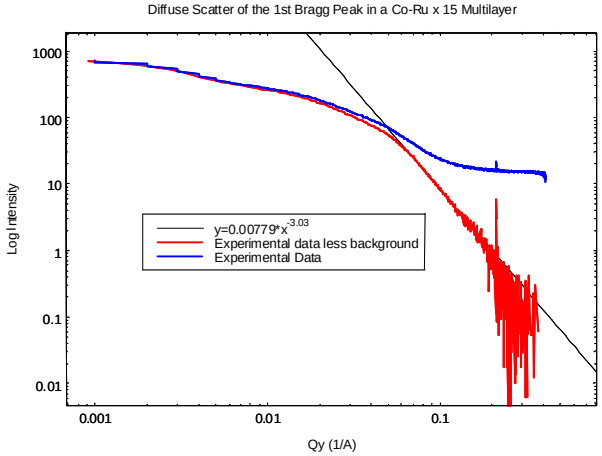

Figure 5 Intensity of 1st Bragg sheet (integrated in q_z) as a function of q_y .