Minicolloque n° CPR5 ☐ **Oral** ☒ **Poster**

Strain relaxation, local concentrations, and dislocations in Fe/Cr trilayers and multilayers grown on MgO and $SrTiO_3$\MgO substrates

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The FeCr system has recently encountered some renewed scientific interest as structural material for ITER because irradiation cascades are easily recovered in this material. Magnetism and diffusion properties are nevertheless not yet well known locally in this system due to the low contrast between Cr and Fe in x-ray diffraction (XRD) and classical TEM (close Z) and the Cr antiferromagnetism. Theoreticians and experimentalists look for physical data to improve the understanding of this system. Multilayers are good model systems for this purpose. Some trilayers and multilayers were grown using molecular beam epitaxy on two different types of substrates. The multilayers were characterized in detail with X-ray diffraction (pole figures) to check the epitaxy and atomic probe tomography to observe the concentration distribution. The strains were studied using the $\sin^2(\psi)$ method (diffraction on all reachable peaks). The interfacial dislocations were imaged in STEM-HAADF mode. The multilayers are good quality superlattices with homogeneous pure Fe and Cr layers and weak oxygen concentration. We find a good agreement between the strains deduced from XRD and STEM-HAADF. The nature of the substrate has a strong effect on the strain at small trilayer thicknesses.

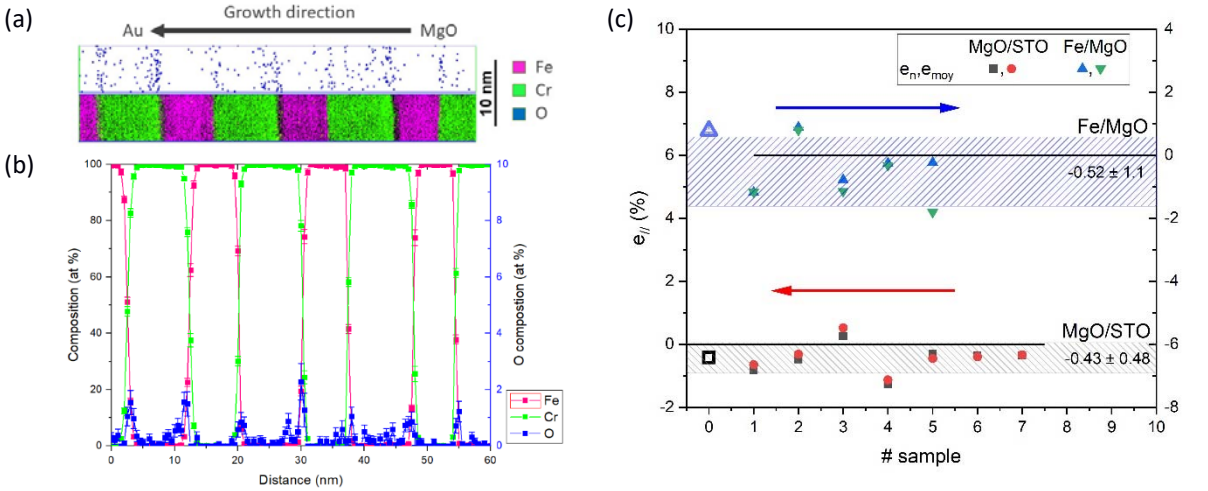

Figure 1: (a) APT image on the MS10 multilayer (on the top position of O atoms) ; (b) concentration profiles (multiplied by 10 for O) through the pure Fe and Cr layers; (c) strains deduced from the dislocation density observed in STEM-HAADF (small symbols) are compared to strains from XRD (large symbols) in MS10.