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In situ time-resolved study of nanoscale diffusion phenomena within Cu/W nano-multilayers using GISAXS

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Nanometric Cu/W multilayers deposited onto Si substrates by RF ion beam sputtering experience a complex residual stress state that arises during deposition and depends on a range of parameters. In addition, the high density of bi-material interfaces in multi-layered systems along with the high volume fraction of grain boundaries within the nanocrystalline layers lead to a large increase in the free energy of the system. These factors promote mass transport, leading to a lower thermal stability and therefore lower reliability of the final multilayer product. In order to understand the diffusion phenomena that begin to occur at unexpectedly low temperatures, Grazing Incidence Small Angle X-Ray Scattering (GISAXS) was used for a temperature and time-resolved study. Additionally, further synchrotron techniques were used for sample characterisation, such as X-Ray Reflectometry (XRR) and Wide-Angle X-Ray Scattering (WAXS). The results will be presented in this talk.

Primary author: ROMANO BRANDT, Leon Manuel (University of Oxford)

Co-authors: Dr SALVATI, Enrico (University of Oxford); PAPADAKI, Chrysanthi (University of Oxford); Prof. KORSUNSKY, Alexander (University of Oxford)

Presenter: ROMANO BRANDT, Leon Manuel (University of Oxford)

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