Structural Studies of Novel Gold Nitride Thin Films (28-01-792, L. Siller - PI)

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The structure of nitride containing gold films produced by reactive ion sputtering and nitrogen plasma etching is investigated using x-ray photoelectron spectroscopy and X-ray diffraction. X-ray diffraction (XRD) measurements were made at room temperature using the 11-axis Huber diffractometer on the XMaS beamline (BM28) at the European Synchrotron Radiation Facility (ESRF) in Grenoble, France. A monochromatic beam of 11keV was chosen such that the incident energy was below the L_3 edge of gold, thereby minimising the fluorescent background from the sample. The data were recorded using a vertical scattering geometry with the diffractometer set-up in a high resolution, double axis configuration where the incident and scattered beams were defined by narrow slits. The instrumental resolution under this configuration was determined from the width of the (400) diffracted beam from a Si (100) wafer and was 0.038±0.001° in 2θ.
It is found that gold nitride is a solid solution of nitrogen atoms dissolved in an fcc gold matrix [1]. Differences between the strain and lattice parameters of gold and gold nitride films were observed and are explained by interstitial nitrogen present in the latter.

[1] X-ray diffraction study of gold nitride films: observation of a solid solution phase, L. Alves, T.P.A. Hase, M.R.C. Hunt, A.C. Brieva and L. Šiller, *J. Appl. Phys.* 104, 113527 (2008).