Contribution ID : **132** Type : **Poster**

The growth of Mn on Cu(100): A core-level photoemission study

The deposition of Mn on Cu(100) at a series of coverages from sub-monolayer to approx. 1.5 ML is carried out using LEED to monitor the surface structure, and core-level photoemission spectroscopy at a photon energy of 140 eV to examine the changes in the electronic and structural properties of the surface. For each spectrum, a best-fit of component Gaussian-Lorentzian peaks is carried out using an x-ray photoemission spectroscopy (XPS) software package [1] and the relative intensities are used in a simple model to explain how the Mn is incorporated as deposition progresses. Of particular interest in this study is the formation of a c(2x2) surface alloy which is well documented in previous work. A low deposition rate of 0.1 – 0.15 ML/min. is achieved. For low deposition times up to ~2 min. (<0.25ML), the c(2x2) alloy is formed in regions on the surface as observed in STM investigations. In addition to this, the results reported here show that alloying continues for higher coverages together with the additional growth of Mn islands on top of the CuMn alloy, a certain amount of contiguous alloy being built up before any islands form. The formation of Mn islands on-top of the alloy hinders alloy growth. A full alloy monolayer is achieved only with a monolayer of Mn sitting on-top of it. Comparison is made to previous models and STM results on this system. The much larger area sampled by photoemission as opposed to that sampled in STM gives a better overall picture of the surface at any particular coverage.

References
[1] Neal Fairley, http://www.casaxps.com

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Session Classification : Poster Session B

Track Classification : Thin Film