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Interfacial structure and morphology of nano-crystalline Ag on Si(111)7x7: an in-situ x-ray scattering study[1] YIYAO CHEN, M.W. GRAMLICH, S.T. HAYDEN, University of Missouri, M.C. TRINGIDES, Iowa State University, P.F. MICELI, University of Missouri — There is intense interest to understand the factors that control the growth of nano-scale metals on supported substrates and, although the Ag/Si(111) system has been extensively studied for this purpose, little is known about the buried interface of the Ag nano-islands because most experimental probes only detect the top surface. Here, we present the results of in situ synchrotron x-ray scattering studies that reveal previously unknown and unexpected features of the buried nano-island/substrate interface. It is found that the incommensurate FCC Ag nano-islands consume the wetting layer upon which they grow and the islands extend to the reconstructed 7x7 Si surface. Consequently, the Ag island height distribution is one monolayer thicker than previously assumed, with a trilayer being the most stable island height at low coverage. Moreover, the lattice spacing of the islands is determined to be the same as bulk Ag, contrary to several prior STM measurements. These results are discussed in terms of the competition between electron confinement effects versus the role of interfacial energy, both of which are important for determining the growth morphology of nano-scale metals on supported substrates.

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