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The Role of a Buried Interface in the Growth of Metallic Nanocrystals: Quantum Size Effects in Ag/Si(111)7x7 YIYAO CHEN, MICHAEL GRAMLICH, SHAWN HAYDEN, PAUL MICELI, University of Missouri-Columbia — It is shown that the buried interface between a metallic nanocrystal and its supporting substrate plays an essential role in understanding the stability of nanomaterials that grow on a wetting layer in the Stranski-Krastanov growth mode. These in situ x-ray scattering studies reveal a minimum tri-layer height for stable incommensurate FCC Ag islands that are in coexistence with a commensurate Ag wetting layer. The minimum height without an oscillating height preference is explained by electron quantum confinement effects, which is manifested differently for Ag(111) than for other metals, such as Pb(111), that can exhibit oscillations of height preference with thickness. The results suggest that quantum size-effects are broadly important for the growth of metallic nanocrystals. Support is gratefully acknowledged from NSF DMR-0706278 and DGE-1069091. The Advanced Photon Source at Argonne National Laboratory is supported by the US-DOE W-31-109-Eng-38.

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