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Effect of Oxygen on the Stability of Ag islands on Si(111)-(7x7)[1]

DAHAI SHAO, Ames Laboratory. Department of Chemistry, Iowa State University, XIAOJIE LIU, NING LU, C.Z. WANG, KAI-MING HO, MICHAEL TRINGIDES, Ames Laboratory. Department of Physics and Astronomy, Iowa State University, PATRICIA THIEL, Ames Laboratory. Department of Chemistry, and Department of Materials Science and Engineering, Iowa State University, THIEL RESEARCH GROUP TEAM — We are working to determine whether an electronic effect known as the quantum size effect can influence chemisorption on Ag islands of different height. We have used scanning tunneling microscopy to probe the effect of oxygen exposure on an ensemble of Ag islands separated by a Ag wetting layer on Si(111)-(7x7). Starting from a distribution dominated by islands that are 1 layer high (measured with respect to the wetting layer), coarsening in ultrahigh vacuum at room temperature leads to growth of 2-layer islands at the expense of 1-layer islands, which is expected. If, however, the sample is exposed to oxygen, coarsening leads to growth of 3-layer islands. There is no evidence for oxygen adsorption on top of Ag islands, but there is clear evidence for adsorption in the wetting layer. Density functional theory supports a model in which traces of oxygen on top of Ag islands can change the height-dependent relative stabilities of the islands. Dahai Shao, et al. Surf. Sci. 606, 1871 (2012).

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Dahai Shao
Ames Laboratory. Department of Chemistry, Iowa State University

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