Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Coverage-Dependent Faceting of Au Chains on Si(557) F.J. HIMPSEL, I. BARKE, F. ZHENG, S. BOCKENHAUER, K. SELL, V. V. OEYNHAUSEN, K.H. MEIWES-BROER, Dept. of Physics, University of Wisconsin Madison, 1150 University Ave, Madison, WI 53706; Institut fuer Physik, Universitaet Rostock, Germany — The structural and electronic phase diagram of Au on Si(557) is established using scanning tunneling microscopy (STM) and angle-resolved photoemission (ARPES). Five phases consisting of altogether seven facets are observed in the sub-monolayer regime. Four of them consist of two coexisting structures. In order of increasing Au coverage the five phases are: Si(111)7×7 + Si(112), Si(557)1×2-Au, Si(111)5×2-Au + Si(335)-Au, Si(111)$\sqrt{3}\times\sqrt{3}$-Au + Si(335)-Au, and Si(111)$\sqrt{3}\times\sqrt{3}$-Au + Si(5 5 11)-Au. The relative surface areas of the five phases and seven facets are determined accurately by depositing a Au wedge ranging from 0 to 0.8 monolayer and performing automatic pattern recognition on large-scale STM images. Angle-resolved photoemission spectra are decomposed into contributions from the five phases. The Fermi wave vectors of various facets are identified. Using Si(557)1×2-Au as reference we find a coverage of 3 Au chains per unit cell for the frequently-studied Si(111)5×2-Au surface (instead of the widely-used value of 2 Au chains). The impact of this finding on structural models is discussed.

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Date submitted: 19 Nov 2008 Electronic form version 1.4