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Au-Induced Nanostructuring of Vicinal Si Surfaces MARK GALLAGHER, WEI WU, LAURA PEDRI, Lakehead University — The deposition of extremely small amounts of metal onto vicinal semiconductor surfaces can cause dramatic changes in morphology on a nanometer scale. Recently this has been exploited to self-assemble arrays of atomic chains that exhibit bands with intriguing one–dimensional (1-d) metallic behavior. Depositing Au onto a vicinal Si(111) sample tilted either towards or away from the $[11\bar{2}]$ can produce an array of 1–d chains running along the $[1\bar{1}0]$direction. To investigate the nanofaceting underlying chain formation, we have measured the surface morphology of several miscuts as a function of Au coverage using scanning tunneling microscopy. Samples oriented 3.8°, 8°, and 12.5° from [111] towards $[11\bar{2}]$ have been measured with Au coverages ranging from less than 0.06 ML up to 0.5 ML. All surfaces exhibit nanofacets with orientations that depend critically on Au coverage. On the 8° sample, while the exact nature of the surface morphology depends on Au coverage, below 0.32 ML all surfaces incorporate (775)-Au nanofacets. Similarly, (775)-Au facets are also observed on the 3.8° sample. At 0.17 ML the surface consists of (111)7x7 and (775)–Au nanofacets. At 0.4 ML the (111) terraces transform from 7x7 to a 5x2, and the surface consists of Si(111)5x2–Au terraces separated by (775)-Au facets. The persistence of the (775)-Au facet reinforces the idea that it represents a low energy facet on these Au modified vicinal surfaces.

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