Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Spontaneous Nanoscale Faceting of Si(100) Surfaces During Aqueous Etching MARC FAGGIN, KENT HALLMAN, BRANDON ALDINGER, ANKUSH GUPTA, MELISSA HINES, Department of Chemistry and Chemical Biology, Cornell University, Ithaca, NY — Although pyramidal texturing of Si(100) surfaces by wet chemical etching has been used industrially to enhance the efficiency of solar cells, the pyramid formation mechanism has eluded understanding. A number of wet chemical etchants have been shown to produce a low density micron-scale hillocks under certain conditions, but atomic-scale probes of these surfaces have revealed considerable roughness rather than perfect faceting. We report the complete chemical transformation of Si(100) surfaces into Si{111}- and Si{110}-nanofaceted surfaces by aqueous chemical etching as confirmed by both morphological probes (STM and AFM) as well as chemical probes (infrared absorption spectroscopy). The high homogeneity of the etched surfaces is unequivocally demonstrated by the very narrow linewidth of the surface vibrational spectrum and the absence of (100) modes. The temporal evolution of the morphology yields mechanistic insights into the hillock formation process; these will be presented as time permits.

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Date submitted: 09 Dec 2009 Electronic form version 1.4