Understanding the Evolution of Silicon Surface Morphology during Aqueous Etching

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A combination of scanning tunneling microscopy (STM) experiments and kinetic Monte Carlo simulations have been used to measure the site-specific reactivity of Si(111) surfaces towards NH$_4$F etching. The observed reactivity is explained on the basis of a pentavalent transition state to oxidation. The effects of isopropanol (IPA) on etching have also been investigated. The morphological effects of IPA on silicon etching are attributed to the slow etching of the silicon isopropoxy species. A new method for the rapid assay of etchant anisotropy is also presented.