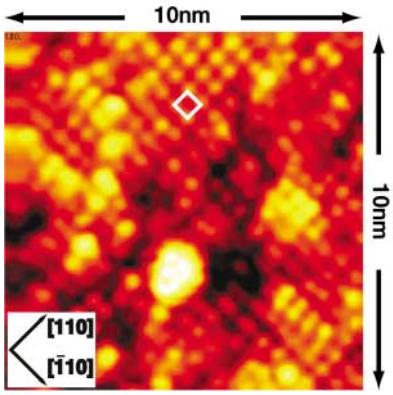
Formation of Monolayer Silicon-Nitride on Si(001) Surface

Yukinori MORITA
Advanced Semiconductor Research Center
e-mail:
y.morita@aist.go.jp
AIST Today Vol. 2, No. 3 (2002) 8

Well-ordered nitrogen-covered Si(001) surfaces were formed for the first time by thermal nitridation using an N_2/H_2 gas mixture. The scanning tunneling microscope images showed a clear Si(001)-2x2 reconstruction over the entire surface. The ordered structure of the nitrided surfaces can be explained by a model in which the surface nitridation by N_2 and the termination of the remaining Si dangling bonds by hydrogen atoms occur simultaneously to minimize the surface free energy during the nitridation reaction.



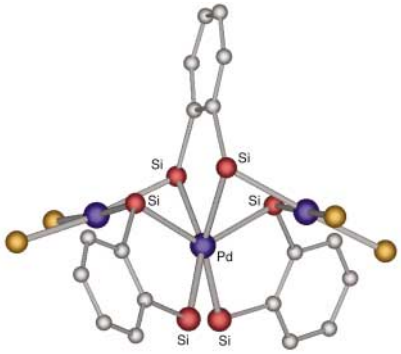
Magnified (10x10 nm) STM image of nitrided Si(001) surface. The atomic arrangement of the 2×2 reconstruction can be clearly recognized on the Si(001) surface, and the 2x2 unit cell is superimposed in the figure.

Discovery of A New Oxidation State for Palladium

Shigeru SHIMADA
Research Initiative for Green Chemical Process
e-mail:
s-shimada@aist.go.jp
AIST Today Vol. 2, No. 3 (2002) 9

A new oxidation state, VI, has been discovered for palladium. Palladium forms one of the most versatile transition metal catalysts for the transformation of organic compounds as well as for vehicle exhaust gas treatment. Palladium generally prefers lower oxidation states such as 0 and II. The highest oxidation state so far known for palladium was IV.

The first Pd (VI) complexes were synthesized by the condensation reaction of three molecules of a simple Pd (II) complex bearing a silicon ligand. This discovery will help the understanding of catalytic processes and design of new catalytic reactions.



6 Si atoms (red) are bound to the central Pd atom (blue)

Synthesis of the Pd(VI) Complexes