Restructuring Due to Quantum Size Effects During Annealing in Ultrathin Films of Ag/Si(111)


— Ultrathin films of silver have been epitaxially grown in situ at low temperature and studied with scanning tunneling microscopy (STM) and reflection high energy electron diffraction (RHEED). Restructuring occurs during annealing to 300 K producing flat-topped islands two atomic layers in height in accordance with previous work. Further annealing produces a diverse distribution of heights and sizes of flat topped, vertical-sided islands. At higher coverage, a smooth films anneal to dendritic structures of a single height. A RHEED transmission pattern is formed after annealing the films and crystal orientation is determined. Finally, annealing above 550K produces typical 3D island “wedding cake” structures atop the √3 x √3 wetting layer on Si(111). These results will be discussed in an “electronic growth” model where Quantum Size Effects are thought to stabilize particular island heights, producing this unusual flat island growth.

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