Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Threading Dislocation Pair Annihilation as a Mechanism for the Growth of Ordered 2D Nanocluster Arrays[1] BOGDAN DIACONESCU, KARSTEN POHL, Physics Department and Material Science Program, University of New Hampshire — The bottom-up approach of growing nanostructured ordered arrays of clusters on the misfit dislocation networks of strained metallic thin films requires a detailed understanding of the nucleation and film-adsorbate interaction processes. In the case of S adsorption on submonolayer Ag / Ru(0001), the Ag's short herring bone rectangular misfit dislocation unit cell of 54Åx40Å (19x16 Ag atoms) reconstructs into a well ordered triangular array of S filled vacancy islands 50Å apart. Atomically resolved VT-STM measurements show that the S cluster growth mechanism involves a local restructuring of the misfit dislocation network of Ag with the final structure free of threading dislocations. The new symmetry and morphology of the composed S/Ag films is obtained via a threading dislocation annihilation mechanism where adjacent and opposite pairs of threading dislocations are replaced by the S filled Ag vacancy islands. The local character of the annihilation process is shown by the conservation of the unit cell size area of 21.5nm^2.

[1]Supported by NSF-CAREER-DMR-0134933 and ACS-PRF-37999-G5

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Date submitted: 05 Dec 2005 Electronic form version 1.4