

REPORT DOCUMENTATION PAGE

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1. AGENCY USE ONLY (Leave blank)

2. REPORT DATE

3. REPORT TYPE AND PERIODICITY

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FINAL REPORT - 01 JUN 01 TO 31 MAY 02

4. TITLE AND SUBTITLE

CATALYSIS BY NANOSTRUCTURES: METHANY-E, ETHLENE OXIDE, AND PROPYLENE OXIDE SYNTHESIS ON AG, CU, OR AU NANOCCLUSERS

5. FUNDING NUMBERS

F49620-01-1-0379

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12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

We have received funds to purchase a variable-temperature, UHV, STM-AFM system with an UHV analytical chamber. The instrument has been purchased and installed and is now working. Fig. 1 shows the microscope and the UHV analytical chamber. The instrument consists of a chamber with a STM and an AFM microscope. The sample can be cooled in the range 30 K to 1000 K. Pictures can be taken at constant temperature. The sample is mounted on a manipulator that can move it in a UHV chamber where we have: sources for metal vapor deposition (to form clusters on the surface), thermal desorption, ion gun (for sample cleaning by sputtering), Auger spectrometer (to monitor surface composition and cleanliness), gas dosers (to adsorb gases on the surface), and thermal desorption equipment. All these and a variety of peripherals (computers, pumps, gauges, etc) have been purchased with funds from the grant.

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18. SECURITY CLASSIFICATION OF THIS PAGE

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19. SECURITY CLASSIFICATION OF ABSTRACT

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20. LIMITATION OF ABSTRACT

Final Technical Report, AFOSR grant F49620-01-1-0379 (equipment)
"Catalysis By Nanostructures: methane, ethylene oxide, and propylene oxide"

We have received funds to purchase a variable-temperature, UHV, STM-AFM system with an UHV analytical chamber. The instrument has been purchased and installed and is now working. Fig. 1 shows the microscope and the UHV analytical chamber. The instrument consists of a chamber with a STM and an AFM microscope. The sample can be cooled in the range 30 K to 1000 K. Pictures can be taken at constant temperature. The sample is mounted on a manipulator that can move it in a UHV chamber where we have: sources for metal vapor deposition (to form clusters on the surface), thermal desorption, ion gun (for sample cleaning by sputtering), Auger spectrometer (to monitor surface composition and cleanliness), gas dosers (to adsorb gases on the surface), and thermal desorption equipment. All these and a variety of

peripherals (computers, pumps, gauges, etc) have been purchased with funds from the grant.

The instrument works very well, as one can see from Figs. 2-4.

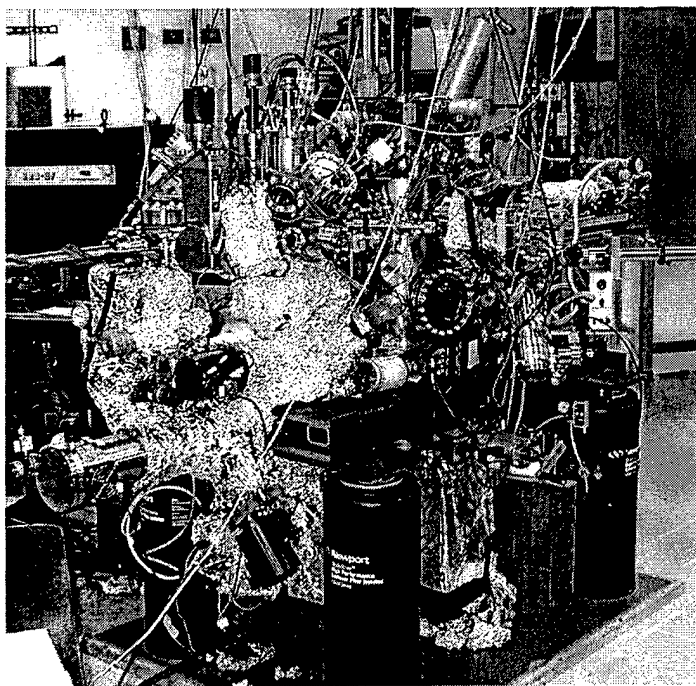
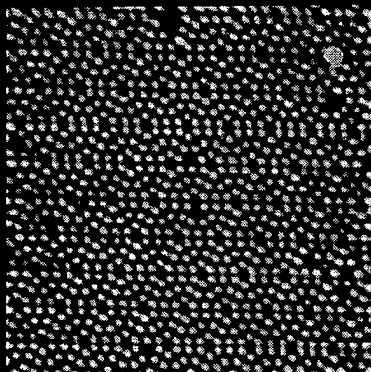


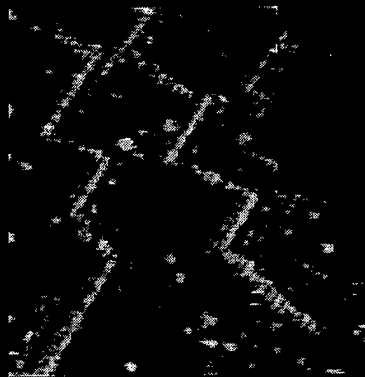
Figure 1. The RHK, variable temperature, ultra-high vacuum microscope (at the left) and the analytical chamber for sample preparation (at the right)

Atomic resolution



Si (111) (7x7)

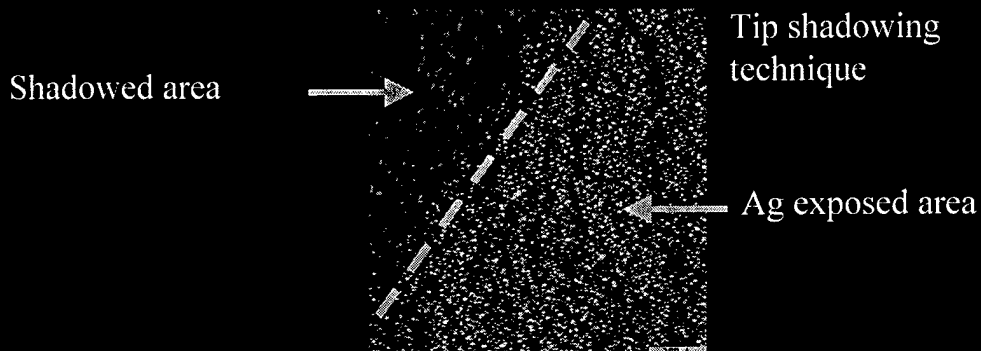
Near atomic resolution



TiO₂ (110) (1x1)

Figure 2. Left: an image of the Si(111) 7X7 with atomic resolution. Right: an image of the TiO₂ (110) 1X1 rutile surface, with near-atomic resolution. The red rows are the 5-coordinated Ti atoms and the dark ones are the oxygen atoms.

Surface nanostructuring for investigation of cluster nucleation, temperature and gas induced coarsening



In vivo nucleation and growth individual as well as an ensemble of the particles

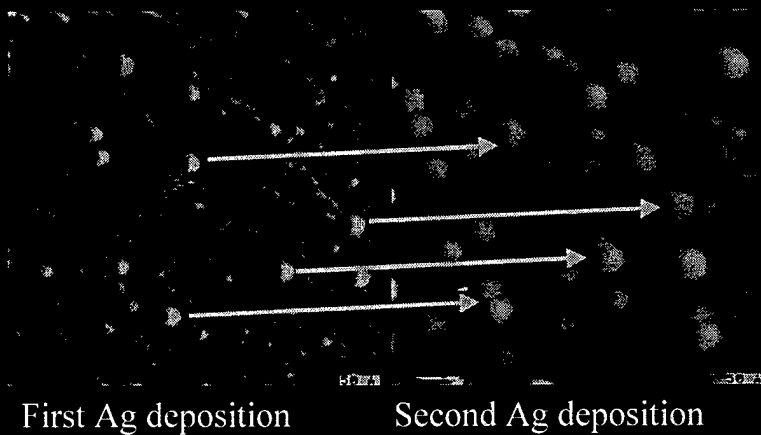


Fig. 3. Nucleation and growth of Ag clusters on a TiO₂ surface

