RECOMMENDATIONS FOR FUTURE WORK

Synthetic and natural SnO_2 samples were imaged using STM following a variety of surface preparations. The SnO_2 surface appeared to flatten considerably, with large unevenly distributed circular features forming following high temperature treatments of up to 1500 K. However, the conductivity of the SnO_2 surface was significantly reduced following annealing at temperatures of approximately 1200-1500 K, making tunneling impossible. Future work in this area could involve the use of lower annealing temperatures and longer annealing times in place of the high annealing temperatures used previously. The longer annealing times (12-48 hours) should help to create a well-ordered, terraced surface which is conducive to atomic scale imaging. The lower annealing temperatures (773-973 K) will minimize decreases in surface conductivity by limiting the thermal diffusion of oxygen from the bulk to the surface, which results in the reoxidation of in-plane vacancies.

The adsorption of water at 163 K is believed to be primarily dissociative on the clean, nearly stoichiometric Cr_2O_3 $(10\underline{1}2)$ surface. Approximately, 0.12 monolayers of water dissociate on a clean, nearly stoichiometric Cr_2O_3 $(10\underline{1}2)$ surface. Repetition of these experiments using infrared adsorption spectroscopy (IRAS) would be helpful in determining the dissociation products formed from water dissociation. The effect of the local defect environment on the dissociation of water could be tested by repeating the clean surface TDS experiments on an ion bombarded Cr_2O_3 $(10\underline{1}2)$ surface. The adsorption of water on Cr_2O_3 $(10\underline{1}2)$ cannot be studied using STM due to the insulating nature of chromium oxide.

The exchange of halogen and oxygen on Cr_2O_3 (10$\underline{1}$2) is completely reversible involving only chemisorbed surface oxygen, not bulk lattice oxygen. No chlorinated desorption products were observed including Cl, ClO, ClO_2, Cl_2O, Cl_2, HCl, and $CrCl_2$ following exposure of a chlorine saturated surface to oxygen. Oxygen desorption was not observed following exposure of an oxygen saturated surface to $CFCl_2CH_2Cl$. The only desorption products identified during TDS resulted from the decomposition of HCFC-131a, including $CFCl{=}CH_2$ and HC≡CH. However, it is possible that other oxidation products went undetected because of the complexity of the CFC cracking pattern. The halogen-oxygen exchange study should be repeated to insure that desorption of an oxidation or halogenation product did not go undetected during TDS. Additionally, ion scattering spectroscopy could be used to determine if thermal diffusion of halogen and/or oxygen into the bulk is occurring during the exchange process.