Investigating the reaction of Benzaldehyde on a Titanium Dioxide Surface

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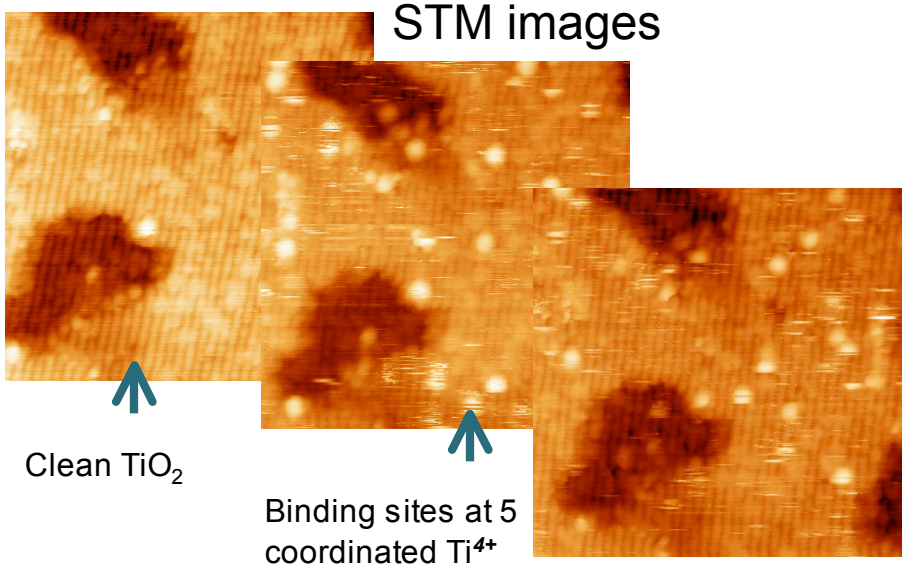
The chemistry occurring on oxide surfaces is relevant to the environment and those concerned with increasing the efficiency of catalytically controlled reactions. Modeling these systems by selecting a well characterized organic compound, benzaldehyde, and an oxide surface, titanium dioxide will help us. The first aim of this investigation is to address the presence of intermediates formed in the reaction are principal goals for this investigation.

We have observed carbon coupling reactions for this system likely attributable to inherent defects of the oxide surface during temperature programmed reaction spectroscopy. Gaining a better understanding of the role of the surface and determining the presence of intermediates formed in the reaction is the second aim for this investigation. Scanning tunneling microscopy experiments revealed that benzaldehyde appears mobile at room temperature. Slow diffusion was observed of benzaldehyde molecules by the sequential imaging of the same area of the surface. To further our understanding of the interaction future work will be done imaging the surface at lower temperatures in order to stop the diffusion of molecules on the sample surface.

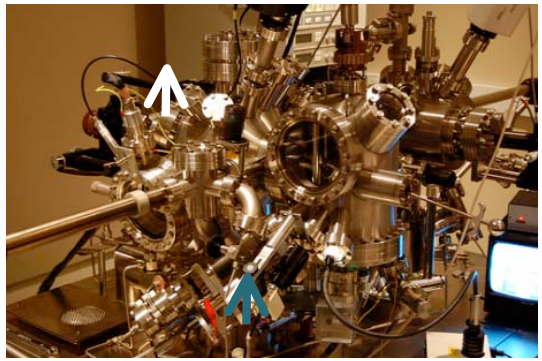
STM images



Clean TiO_2

Binding sites at 5 coordinated Ti^{4+} ions

Observe diffusion



Imaging parameters: +2.10V, 0.07 nA, 30nmx30nm, 300K

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