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Site Specific Molecular Chemisorption of O_2 on TiO_2(110): A Scanning Tunneling Microscopy Study ZHITAO WANG, YINGGE DU, ZDENEK DOHNÁLEK, IGOR LYUBINETSKY, Pacific Northwest National Laboratory — The investigation of O_2 adsorption on TiO_2 is critical since it can help us to better understand the photooxidation mechanism of TiO_2. In our work, molecularly chemisorbed O_2 were directly imaged on reduced TiO_2(110) at 50 K with scanning tunneling microscopy (STM). Two O_2 adsorption channels, one at bridging oxygen vacancies (V_O) and another at five-fold coordinated Ti atoms (Ti_{5c}), have been identified. While O_2 at Ti_{5c} appears as a single protrusion, the O_2 at V_O manifests itself by a disappearance of the V_O feature. It is found that STM tip can easily dissociate O_2 and the dissociation details strongly depend on the tunneling conditions and the type of the O_2 adsorption site. The chemisorbed O_2 at these two distinctive sites are the most likely precursors for the two previously established O_2 dissociation channels, observed at temperatures above 150 and 230 K at the V_O and Ti_{5c} sites, respectively

Zhitao Wang
Pacific Northwest National Laboratory

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