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Adsorption and Reaction of Methanol on Anatase TiO_2(101) ARJUN DAHAL, Department of Physics, University of South Alabama, Mobile AL, ZDENEK DOHNLEK, NIKOLAY PETRIK, GREG KIMMEL, Physical and Computational Sciences Directorate and Institute for Integrated Catalysis, Pacific Northwest National Laboratory — Anatase TiO_2 is used extensively in a wide range of heterogeneous and photocatalytic processes. As such, understanding the interaction of prototypical organic compound methanol with anatase is of high importance. In this study, we employ scanning tunneling microscopy and temperature programmed desorption to study the adsorption and reaction of methanol on anatase TiO_2(101). We find that adsorption of molecular methanol at 80 K leads to the formation of chains along the titania rows. These chains are metastable and fall apart upon annealing due to the repulsion of neighboring molecules. Further, we find that methanol deprotonates to produce neighboring methoxy and hydroxyl groups following the annealing of high coverages to room temperature. The coverage of methoxy and hydroxyl groups can be increased with repeated adsorption and annealing cycles, and the annealing above room temperature leads to the recombinative desorption of methanol.

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