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Imaging Surface Reactions of Formaldehyde on TiO_2 ZHENRONG ZHANG, Department of Physics, Baylor University, MIRU TANG, Department of Chemistry and Biochemistry, Southern Illinois University, ZHI-TAO WANG, Pacific Northwest National Laboratory, ZHU KE, YAOBIAO XIA, KENNETH PARK, Department of Physics, Baylor University, IGOR LYUBINETSKY, ZDENEK DOHNÁLEK, Pacific Northwest National Laboratory, QINGFENG GE, Department of Chemistry and Biochemistry, Southern Illinois University — Formaldehyde is involved in many surface catalytic and photo-catalytic reactions on metal oxides. We studied surface reactions of formaldehyde on reduced $TiO_2(110)$ surfaces using variable-temperature scanning tunneling microscopy (STM) and density functional theory (DFT). STM images taken from a same area at various temperatures clearly show that formaldehyde preferentially adsorbs on the bridge-bonded oxygen vacancy (V_O) defect sites. Bias-dependent STM images suggest the bonding configurations of the Ti-bound CH_2O and the V_O-bound CH_2O. The isothermal time dependent images show the rotation of V_O-bound CH_2O and the two diffusion channels of formaldehyde at different temperatures. We also directly observed the formation of formaldehyde dimmer.

Zhenrong Zhang
Department of Physics, Baylor University

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