

Abstract Submitted
for the TSS15 Meeting of
The American Physical Society

Molecular Coupling of Formaldehyde on Rutile TiO₂(110) KE ZHU, YAOBIAO XIA, Baylor Univ, MIRU TANG, Southern Illinois Univ, ZHI-TAO WANG, Pacific Northwest National Laboratory, BRYAN JIAN, Baylor Univ, LYUBINETSKY IGOR, ZDENEK DOHNÁLEK, Pacific Northwest National Laboratory, QINGFENG GE, Southern Illinois Univ, KENNETH PARK, ZHENRONG ZHANG, Baylor Univ — Molecular coupling of formaldehyde is imaged by variable temperature scanning tunneling microscope (VT-STM) on Rutile TiO₂(110) surfaces in our study. Two different molecular coupling reactions are identified via time-elapsd sequences of STM images. A formaldehyde bounded at a bridging oxygen vacancy site (V_O-bound CH₂O) couples with Ti-bound CH₂O to form a static and stable diolate at room temperature and low temperatures. Also, two V_O-bound CH₂O molecules couple with each other to form a Ti-bound species and desorb above 215 K. This coupling reaction heals both the V_O sites indicating formation and desorption of ethylene. In addition, we directly observe the diffusion of methylene groups to nearby empty V_O sites formed upon dissociation of the C-O bond in V_O-bound formaldehyde, which suggests that the ethylene formation is via coupling of the methylene groups. These results will be discussed with previously reported chemistry of formaldehyde on TiO₂ surface.

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Date submitted: 06 Feb 2015

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