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Water on anatase TiO_2(101): a scanning tunneling microscopy study Y.B. HE, O. DULUB, L.H. YING, U. DIEBOLD, Tulane University, C. DI VALENTIN, Universita degli Studi di Milano-Bicocca, Italy, A. TILOCCA, University College London, UK, A. SELLONI , Princeton University — The discovery of photochemical water splitting on TiO_2 has motivated numerous studies of water on the surfaces of this important photocatalytic material. Previous temperature-programmed desorption and X-ray photoelectron spectroscopy studies of water on anatase TiO_2(101), the most stable surface of the photocatalytically efficient anatase form, have revealed that water adsorbs molecularly on the surface in accordance with theoretical predictions.In the present study, we have employed low-temperature scanning tunneling microscopy to study water adsorption on anatase TiO_2(101). We dose various amounts of water (0.2-1.8 Langmuir) at sample temperature T $\sim$ 130 K. Besides confirming that water favors molecular adsorption, atomically resolved STM images further reveal that water molecules adsorb at Ti_{5c} sites forming preferentially one-dimensional chains with local doubling of the periodicity along the [010] direction. Near room temperature, the water molecules become mobile and hop between the Ti_{5c} sites. Density Functional Theory calculations are under way to clarify the origin of the observed doubling of periodicity.

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