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Scanning Tunneling Microscopy Study of a Vicinal Anatase TiO_2 Surface SHAO-CHUN LI, OLGA DULUB, ULRIKE DIEBOLD, Department of Physics, Tulane University, DEPARTMENT OF PHYSICS, TULANE UNIVERSITY COLLABORATION — Titanium dioxide finds versatile applications in various technical fields including gas sensing, coatings, pigments, heterogeneous catalysis, photocatalytic degradation of pollutants, and solar cells. TiO_2 is found in three main crystallographic phases: rutile, anatase and brookite. Rutile is the thermodynamically most stable form and is considered a model system for basic research. However, anatase TiO_2 is often considered to be catalytically more active than rutile for reasons not yet completely understood. In this work, using scanning tunneling microscopy (STM) and low energy electron diffraction (LEED), the structure of the anatase $TiO_2(5\ \overline{14})$ surface, $\sim 10^\circ$ vicinal to the – lowest energy – (101) plane, has been studied. The surface was found to facet into a structure composed of ridges with a uniform width of 5 lattice units. Based on atomically-resolved STM and electron counting rules, it is proposed that the sides of the ridges are parallel to $(1\ \overline{10})$ and (112) planes. These sides might be reconstructed to stabilize the microfaceted structure. Vapor-deposited gold shows pronounced clustering between the ridges, indicating a one-dimensional template effect of the vicinal surface, which supports denser and more uniformly sized Au clusters, as compared to the flat (101) surface.

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