

## **NC-AFM and STM Study of Methylphosphonic Acid on TiO<sub>2</sub>(110)**

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We have used STM and NC-AFM to study the adsorption of methylphosphonic acid (MPA) [CH<sub>3</sub>P=O(OH)<sub>2</sub>] on rutile TiO<sub>2</sub>(110)1×1. STM images of low coverage MPA show bright spots (presumably MPA) on the bright rows. As the bright rows in STM have been shown to correspond to Ti 5-fold sites using both theoretical simulations of STM and a variety of chemical probes, our STM images indicate that MPA adsorbs on these Ti sites, presumably via the dissociation of one or two protons from the acid groups. As the coverage approaches 0.5 ML, STM and NC-AFM images show an ordered overlayer with 2×1 symmetry consistent with the low energy electron diffraction pattern. Whilst it is difficult to assign bonding configurations with scanning probe methods alone, a tridentate bonding mechanism is ruled out due to the alignment of the MPA with the Ti rows. Between bidentate and monodentate configurations, intuitively one would expect a bidentate configuration as a saturated monolayer of bidentate bonded molecules along the Ti rows leads to a 2×1 overlayer as shown with various carboxylates.