X-ray Induced Reorganization/Polymerization of Resorcinol on the TiO$_2$ Rutile (110) Surface VINOD KUMAR PALIWAL$^1$, SHAO-CHUN LI, ULRIKE DIEBOLD$^2$, Department of Physics and Engineering Physics, Tulane University, New Orleans, LA 70118, USA. — The room-temperature adsorption of resorcinol (1, 3 benzenediol, C$_6$H$_4$(OH)$_2$) on the (110) surface of rutile TiO$_2$ was investigated with STM and x-ray photoemission (XPS). The saturation coverage of resorcinol is smaller as compared to catechol (1,2 benzenediol) with a C1s/Ti2p$_{3/2}$ ratio of $\sim 7.3\%$ and 12\%, respectively. This indicates that resorcinol occupies on average more than two Ti sites on the surface. STM suggests that resorcinol molecules are mobile at lower coverage, whereas a weakly-ordered overlayer with a periodicity of 3 unit-cells along [001] is observed at higher coverages. Interestingly, exposure of resorcinol-saturated TiO$_2$ surface to an XPS Mg-K$_\alpha$ beam (1253.6 eV) induces a reorganization of adsorbed resorcinol molecules. STM shows well-resolved double chains that run across [001]-oriented rows of TiO$_2$(110) surface. These results suggest that irradiation induces a polymerization reaction of adsorbed resorcinol molecules, where neighboring aromatic rings are arranged in a zig-zag configuration.

$^1$Dyal Singh College (University of Delhi), New Delhi-110003, India.
$^2$Institute of Applied Physics, Vienna University of Technology, Wiedner Hauptstrasse 8-10, Vienna, Austria.

Ulrike Diebold

Date submitted: 14 Dec 2010

Electronic form version 1.4