Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Photocatalysis of Thin Films of TiO_2 on Al_2O_3 Substrates[1] DAVID TURBAY, Brown University, TIMOTHY LUTTRELL, MATTHIAS BATZILL, University of South Florida — Titanium dioxide (TiO_2) has grown to be one of the most promising photocatalysts in recent years because of extensive applications in renewable and clean energy. The rise in demand for these new energies has driven an increase in research on metal oxides and their properties. Our interest in growing the rutile structure of TiO_2 stems from its lower excitation energy (3.0 eV) when compared to anatase (3.2 eV), which indicates it has better activity in the visible portion of the spectrum. It has been shown that sapphire (Al_2O_3) substrates are conducive to epitaxial rutile growth. In this study, we measured the photocatalytic activity of thin films of TiO_2 on r-Al_2O_3 (1 -1 0 2) substrates. We used PLD and MBE to grow the films, which were characterized using XPS and AFM. Photoactivity was measured via the decomposition of methyl orange on the film's surface using a UV/VIS spectrophotometer. The decomposition of this organic compound is driven by oxidation-reduction reactions on the surface of the TiO_2 film. From this, we calculated the charge carrier diffusion length and compared it to that of anatase.

[1]Funding provided by NSF Grant DMR-1004873

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Date submitted: 09 Nov 2012 Electronic form version 1.4