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"The influence of ferroelectric fields on spatial separation of oxidation and reduction reactions on TiO_2 coated $BaTiO_3$"

Friday, March 28, 2008
11:30 A.M. Seminar in Baker Hall A51
Refreshments precede seminar at 10:30 A.M. in 2325 Wean Hall

Colloidal metal oxides have been suggested as photocatalyts for the dissociation of water to create hydrogen fuel. Major factors limiting the efficiency of these photocatalysts are the recombination of photogenerated charge carriers and the back reaction of intermediate chemical species that recombine to form water. These recombination losses could be minimized if the photogenerated electrons and holes were spatially separated and if the oxidation and reduction reactions occurred at different locations. Previous studies of the photochemical activity of $BaTiO_3$ have shown that the ferroelectric field acts to drive electrons and holes to different locations on the surface, thus creating spatially separate sites for reduction and oxidation reactions. While the use of a bare ferroelectric surface in photocatalysis achieves the goal of separating the charge carriers and reaction products, ferroelectrics are susceptible to photocorrosion and degradation in an aqueous environment, and therefore cannot be used as photocatalysts. A suitable solution to exploit the ferroelectric's dipolar field while avoiding catalyst degradation is to cover the ferroelectric with a protective, catalytic, semiconducting film. In this study, we show that the dipolar field from a ferroelectric can influence the motion of charge carriers in a catalytic coating, leading to the spatial separation of the oxidation and reduction reactions.

Nina received her Bachelor degree in Materials Science and Engineering from the University of Florida in 2004. She is currently a Ph.D. candidate under the guidance of Prof. Rohrer.