Center for Catalytic Science & Technology

CCST Seminar:

UNIVERSITY OF DELAWARE

- Tuesday, July 22, 2008
- 11:00 A.M. (refreshments available at 10:45 a.m.)
- 366 Colburn Laboratory

Dr. Donia Friedmann

Dr. Donia Friedmann has been working in the areas of particle synthesis and TiO_2 photocatalysis for over 10 years. Her research interests have been primarily in particle technology with the research focus on understanding the link between particle properties and their behaviour as photocatalysts. Most recently, she was working at the Interdisciplinary Nanoscience Center, Aarhus University in Denmark, with the Scanning Tunneling Microscopy group studying TiO_2 surfaces at atomic scale resolution. Prior to that, she was working on the design of metal deposited TiO_2 photocatalysts at the Institute for Technical Chemistry, University of Hannover in Germany, as a Humboldt postdoctoral research fellow (2005). She completed her chemical engineering degree in 1997 and PhD in 2000, both at the University of New South Wales in Sydney, Australia.

"Photocatalysis Research: Designing Improved Photocatalysts"

Chemical engineering research is interdisciplinary by nature. This certainly holds true from the author's own experience in basic and applied research of photocatalytic processes, particularly TiO_2 photocatalysis for water treatment applications. Semiconductor photocatalysis involves the interaction between light (having sufficient energy) and a semiconductor photocatalyst, with the subsequent activation of the photocatalyst to generate highly active species including hydroxyl radicals and conduction band electrons. These active species can be targeted to destroy organic and inorganic pollutants in photocatalytic reactions.

Advances in photocatalytic technologies have been significant in recent years. Applications include environmental technologies for air and water purification and architectural applications such as self-cleaning surfaces and anti-bacterial coatings. While many of its fundamental processes have been clarified, the complexity of photocatalysis is yet to allow for definite conclusions on some important aspects. For example, on a fundamental level, information is still needed on the mechanistic role of the various photogenerated active species and the influence of parameters such as the crystal phase of TiO_2, defects and impurities. On an applied level, information is lacking on photocatalyst durability and recycling.

This talk covers the basic principles of photocatalysis and gives an overview of developments of applications and trends. Emphasis is placed on the author's research work on the design of photocatalysts of improved efficiencies and analysis of the intimate relationship between structure, electronic properties and reactivity of TiO_2, for application in photocatalytic water treatment processes. Recent results on the design of Ag/TiO_2 photocatalysts and durability studies will be discussed.

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