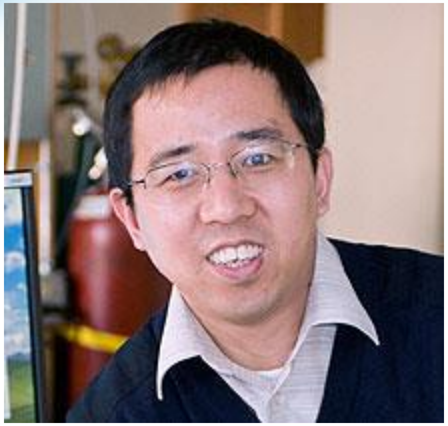
Spectroscopy and Photoscience Lectures



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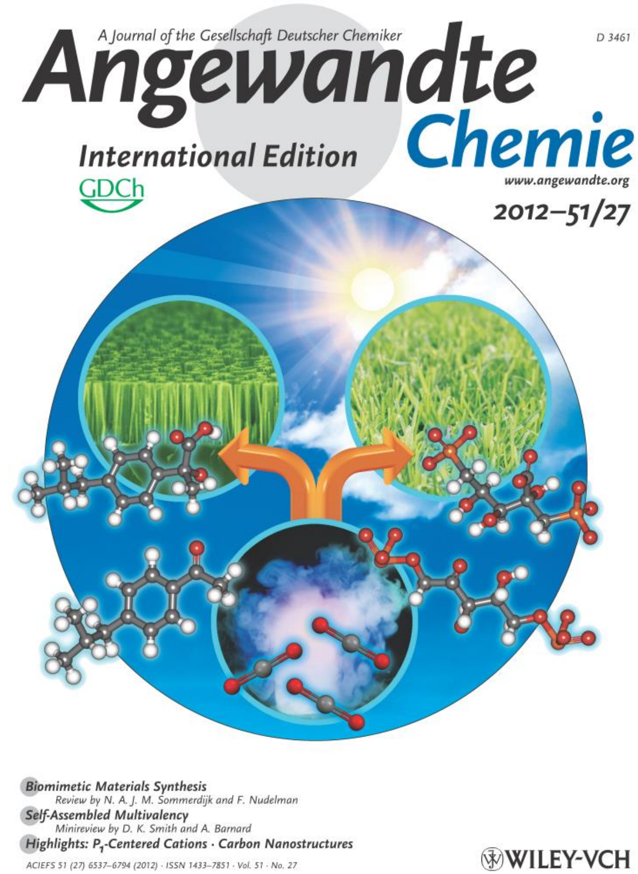

Title: From Water and Carbon Dioxide to Solar Fuels using "Rust" and "Dirt"
Time: 2016/1/7(Thu), 16:30 – 17:30
Place: Rm. 3300

From Water and Carbon Dioxide to Solar Fuels using “Rust” and “Dirt”

Dunwei Wang, Department of Chemistry, Boston College

Abstract: Solar energy can be directly harvested to power thermodynamically uphill reactions that produce energetic chemicals, promising a large-scale energy storage and redistribution solution. To enable these reactions, we need materials that can absorb light, separate charges, and catalyze specific chemistries. The materials should be made of earth-abundant elements to allow for large-scale implementations. They also need to be resistant against photo corrosion. To date, a low-cost, long-lasting material that can produce solar fuels with an economically meaningful efficiency remains elusive. In this talk, we present our efforts aimed at understanding what limits the development of this important field. Within the context of photoanode and photocathode, we show how the photoelectrode properties are changed by introducing material components designed for improving charge transport, surface potential accumulation, and interface kinetics, respectively. We also demonstrate that highly complex organic molecules can be produced by photoreduction of CO_2, in a fashion similar to the dark reactions in natural photosynthesis. Our results highlight the importance of separately understanding thermodynamic and kinetic factors in complex systems such as that for solar fuel production. Detailed knowledge generated by our research contributes to the goal of realizing low-cost, high-efficiency artificial photosynthesis.