

TCSUH SPECIAL SEMINAR

Dr. Ying Yu

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Thursday, February 28, 2019

Room 102, Houston Science Center

10:45 am – 11:45 am

Photocatalytic CO₂ Reduction to Fuels by Cu₂O-Based Nanomaterials

ABSTRACT: Energy conversion such as CO₂ reduction to fuel needs catalysts with high activity and stability. Nanostructured materials are promising for future application in this area. Although there are a large number



of related publications, the catalytic activity and stability for energy conversion is still far from application. So far, Cu₂O materials have been widely investigated as catalysts for photochemical CO₂ conversion. In order to address the issues for Cu₂O materials with low activity and stability, we have prepared and modified nanostructured Cu₂O based materials for photochemical CO₂ reduction to organic fuel. It is found that the hybridization with TiO₂ greatly improves the activity of Cu₂O but the stability of the composite is still low. However, the synthesis of carbon layer coated cuprous oxide (Cu₂O) mesoporous nanorods on Cu foils achieves the “hitting three birds with one stone” strategy. The thin carbon layer not only works as a protective layer to quench the common photocorrosion problem of Cu₂O, but also endows the sample a mesoporous and one-dimensional

nanorod structure, which can facilitate reactant molecule adsorption and charge carrier transfer. Substantially, the coated samples exhibited remarkably improved stability as well as decent activity for CO₂ reduction under visible light irradiation. The optimized sample attained an apparent quantum efficiency of 2.07% for CH₄ and C₂H₄ at $\lambda_0 = 400$ nm, and 93% activity remained after six photoreduction cycles under visible light. Additionally, through Cl doping, the prepared nanostructured Cu₂O fulfills the goal of the CO₂ photocatalytic reduction and simultaneous water oxidation. Moreover, a small bias is efficient to ease the unstable issue for Cu₂O.

BIO: Dr. Ying Yu obtained her Ph.D. degree from Nankai University, China, in 2000. She once worked as a postdoc under the supervision of Profs. P. K. Wong and Jimmy C. Yu in the Chinese University of Hong Kong during 2003-2004. From April, 2005 to May, 2006 she joined Princeton University as a visiting staff member. From June, 2006 to May, 2007, she was engaged in the study of nanotube arrays as a postdoc in Prof. Zhifeng Ren's group at Boston College. Her current research areas include 1) CO₂ conversion to organic fuel in photochemical, electrochemical and photoelectrochemical systems, 2) photocatalysis for organic pollutant degradation, and 3) nanostructured electrocatalysts for water splitting and N₂ fixation. So far, 2 book chapters and more than 125 peer reviewed journal papers have been published and have been cited more than 5500 times, and her H-index reaches 40.

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