SAND2007-1632C

PORPHYRIN-BASED NANOSTRUCTURES FOR SOLAR HYDROGEN PRODUCTION

Zhongchun Wang*[,1] Lindsey Evans,[1] Craig J. Medforth,[1] James E. Miller,[1] and John A. Shelnutt[1,2]

[1]Sandia National Laboratories, Albuquerque, NM 87185, USA; [2]Department of Chemistry, University of Georgia, Athens, GA 30602, USA; * E-mail: zwang@sandia .gov

The self-assembly approach to the design and synthesis of functional materials is widely adopted in the materials research community. Porphyrins and their analogues are particularly attractive building blocks for self-assembly because of their well-defined geometry and wide spectrum of desirable optical, electronic, and catalytic properties. Recently we have synthesized a series of porphyrin-based nanostructures by self-assembly, *e.g.*, nanospheres, nanotubes and nanosheets. These nanostructures typically exhibit a broad absorption profile in the UV-visible region, a feature advantageous for their use as solar light harvesters. Furthermore, their highly organized internal structures may facilitate charge separation and transport as well as energy transfer inside the nanostructures. The nanostructures containing Sn- or Sb-porphyrins are found to be efficient photocatalysts, and photocatalytic self-metallization provides a facile means to fabricate porphyrin-metal hetero-architectures that are being used to build multi-component water-splitting nanodevices. Solar hydrogen evolution with high efficiency has been demonstrated *via* an energy transfer mechanism using platinized porphyrin nanorods or nanospheres as the solar light harvesters.

This work was supported by the Division of Chemical Sciences, Geosciences and Biosciences, Office of Basic Energy Sciences, U.S. Department of Energy (DE-FG02-02ER15369). Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under Contract DE-AC04-94AL85000.