Towards Sustainable Hydrogen Production: Nanostructured Materials and Devices

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Globally more than 36 million metric tons of hydrogen are produced each year for use as reactant in refining crude oil into transportation fuels, and forming chemicals and food products including fertilizers and partially hydrogenated vegetable oils. Hydrogen also has the highest energy density of any non-nuclear fuel and can be easily converted to electrical and thermal energy via highly efficient, non-polluting processes. Consequently, hydrogen has attracted substantial attention for use as a fuel. Progress towards the use of hydrogen as an energy carrier and improving the sustainability of current hydrogen production technologies will rely on the discovery and development of better performing materials and devices. This presentation will describe our efforts to design and synthesize high performance, nanostructured materials for the production of hydrogen, and their application in photoelectrochemical cells and thermally integrated fuel processors.