

# Journal of Photonics for Energy

PhotonicsforEnergy.SPIEDigitalLibrary.org

## **Special Section Guest Editorial: Advanced Materials and Devices for Solar Driven Liquid Fuel and Hydrogen Production**

Liejin Guo  
Clemens Burda  
Maochang Liu

**SPIE.**

Liejin Guo, Clemens Burda, Maochang Liu, "Special Section Guest Editorial: Advanced Materials and Devices for Solar Driven Liquid Fuel and Hydrogen Production," *J. Photon. Energy* **10**(2), 023501 (2020), doi: 10.1117/1.JPE.10.023501

# Special Section Guest Editorial: Advanced Materials and Devices for Solar Driven Liquid Fuel and Hydrogen Production

Liejin Guo,<sup>a</sup> Clemens Burda,<sup>b</sup> and Maochang Liu<sup>a</sup>

<sup>a</sup>Xi'an Jiaotong University, International Research Center for Renewable Energy, State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an, China

<sup>b</sup>Case Western Reserve University, Center for Chemical Dynamics and Nanomaterials Research, Department of Chemistry, Cleveland, Ohio, United States

Traditional imprudent approaches for carbon-based energy conversion and utilization have brought irreversible destruction to ecological cycles. The need for clean, efficient, and renewable energy alternatives has motivated governments and researchers to launch research projects with the aim of contributing to the realization of energy sustainability through theoretical and technological scientific breakthroughs. For example, in 2019, the National Natural Science Foundation of China started the Basic Science Center Program for “Order-ised Energy Conversion” (OEC). This project, led by Prof. Liejin Guo from the State Key Laboratory of Multiphase Flow in Power Engineering of Xi'an Jiaotong University of China, gathers many top energy-related research groups throughout China, particularly in the field of solar hydrogen/fuel production.

To further advance research in the field of solar hydrogen/fuel production, this [special section of Volume 10, Issue 2](#) of the *Journal of Photonics for Energy* includes eight original research articles that address fundamental and applied aspects of solar-to-hydrogen or solar-to-fuel conversion. The special section is intended to present research in advanced nanomaterials, devices, and integrated systems for photocatalytic, photoelectrochemical, and photovoltaic solar hydrogen/solar liquid fuel production, as well as results related to interfacial and surface processes and reaction mechanisms. These areas are represented by several reports in this section. [Naixu Li et al.](#) demonstrate the enhanced photocatalytic CO<sub>2</sub> reduction by the synthesis of Ni-doped mesoporous TiO<sub>2</sub> nanocrystals with tablet morphologies, as well as the Ag cocatalyst. [Jiangang Jiang et al.](#) report the improvement of a series of 3-D ZnO/CdS photoelectrodes through a two-step hydrothermal approach with different cadmium precursors resulting from a 3-D structure with an opened-up, porous morphology. [Yuzhou Jiang et al.](#) investigate the effect of mixed-sacrificial reagents on hydrogen evolution over two typical photocatalysts, i.e., g-C<sub>3</sub>N<sub>4</sub> and TiO<sub>2</sub>. [Jian Zhang et al.](#) report the excellent photocatalytic property of Fe<sub>2</sub>O<sub>3</sub>/g-C<sub>3</sub>N<sub>4</sub> composite with the Z-scheme heterojunction. [Penghui Guo et al.](#) compare the optical property, surface charge state, and photocatalytic behavior of ZnO with different exposure faces. [Nana Jia et al.](#) investigate the effect of different pyrolysis temperature on electrocatalytic activities of the carbon fibers-coated Co@N-doped porous carbon derived from ZIF-67/alginate fibers. The section also features more applications with several reports on the investigations into photo transfer and photothermal systems. [Linqi Zhang et al.](#) demonstrate the characteristics of solar radiative transfer and participating media through analysis of aerosol particle samples from different weather conditions. [Bo Bai et al.](#) report a photothermal polymethylsilsesquioxane-vinyltrimethoxysilane-polypyrrole xerogel for efficient solar-driven viscous oil/water separation through one-pot synthesis route.

It is hoped that the articles presented in this special section will provide some representative snapshots regarding aspects of solar hydrogen/fuel production, from material science to systems engineering.

**Liejin Guo** received his PhD in power engineering and engineering thermal physics from Xi'an Jiaotong University. He is a member of the Chinese Academy of Sciences and currently serves as a full professor and the director of International Research Center for Renewable Energy,

State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an Jiaotong University, China. His research interests include multiphase flow, heat transfer, and renewable energy technologies.

**Clemens Burda** received his Ph.D. from the University of Basel, Switzerland. He was then a postdoctoral fellow at Georgia Institute of Technology. He is currently the Director of the Center for Chemical Dynamics and Nanomaterials Research and a professor in the Chemistry Department at Case Western Reserve University. His work focuses on the ultrafast spectroscopy of nanomaterials and molecular systems.

**Maochang Liu** received his PhD in power engineering and engineering thermal physics from Xi'an Jiaotong University. He is a full professor in International Research Center for Renewable Energy, State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an Jiaotong University, China. His research focuses on the controlled synthesis of metal and semiconductor nanoparticles and application in photocatalysis and electrocatalysis.