

Renewable Energy and Resources & Energy Materials and Fuel Cell Research

August 27-28, 2018 | Boston, USA

Earth-abundant nanostructured materials for efficient solar fuel production

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If solar energy is to become a practical alternative to fossil fuels, we must have efficient ways to convert photons into electricity, fuel, and heat. To this end, direct solar energy conversion to storable fuels offers a promising route toward less reliance on fossil fuels. The development of a successful solar-fuel-generation technology would require the invention of new photoactive materials that accomplish the combined tasks of light harvesting, charge separation, and compartmentalized chemical transformations. One of the most critical issues is the development of a suitable semiconductor photoanode with high efficiency and long-term durability in aqueous environments. In addition, the lack of effective oxidation and reduction catalysts is among the most serious obstacles preventing the development of an efficient and scalable artificial fuel generator. In this regard, nanoscience can make a difference. This talk will cover the assembly and development of new semiconductor nanoarchitectures as well as interface control for the purpose of solar energy conversion in general and direct solar-to-chemical energy conversion in particular.

Biography

Nageh Allam received his PhD in materials science and engineering from Pennsylvania State University and pursued his postdoctoral studies at both Georgia Institute of Technology and Massachusetts Institute of Technology (MIT). He joined the faculty at The American University in Cairo (AUC), where he is currently an Associate Professor with tenure. Allam's research is multidisciplinary in nature as it is at the interface between nanoscience, physics and chemistry. It deals with the development of a set of synthetic and fabrication techniques to obtain well-designed nanostructured materials with composition, size and shape control for use in energy conversion and storage, sensors applications, biomedical applications, among others. The research comprises both experimental and theoretical activities. He has published more than 120 papers in reputed peer-reviewed international journals and has authored more than 90 conference articles. He is the recipient of the Ford Foundation international graduate fellowship, RAK-CAM postdoctoral fellowship, the World Academy of Sciences (TWAS) Yong Scientist Award, the Showman Foundation Award in Applied Sciences, the State of Egypt Award in Advanced Technological Sciences and the AUC Excellence in Research and Creative Endeavors Award.

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