

ECE Speaker Series

Department of Electrical
and Computer Engineering

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Plasmon-Enhanced Solar Energy Conversion in Semiconductor-Metal Heterojunctions

Solar energy can be converted either to electric energy via photovoltaics or to chemical energy via photocatalysts. Emerging of surface plasmon resonance (SPR) provides a new opportunity to improve the performance of photocatalysts and photoelectrochemical cells. This talk will present our effort on fundamental understanding of the underlying mechanism of plasmon-enhanced solar energy harvesting. In particular, the speech will discuss our newly discovered plasmon-induced resonant energy transfer (PIRET) mechanism in the metal-semiconductor heterojunctions. The PIRET mechanism along with the hot electron transfer process suggests that plasmonic nanostructures can act as photo-sensitizers. The discovery of plasmonic photo-sensitizers has opened a new avenue to develop efficient photocatalysts and solar cells. The theoretical maximum efficiency of solar energy conversion in plasmonic metal-semiconductor heterojunctions is predicted. This talk will demonstrate our effort on development of effective plasmonic metal-semiconductor heterojunctions to enable strong coupling between the plasmonic metal and the semiconductor. Our results show that the performance of solar water splitting by a hematite nanorod array can be greatly improved by plasmon-induced photonic and energy transfer enhancement. In my group in address this class of problems. Several examples illustrating the efficacy of these methods and their application to a range of problems will be presented.

April 24, 2017 at 10:00am in Egr Bldg 2, Rm W122

Dr. Nianqiang (Nick) Wu is currently Professor of Materials Science in Department of Mechanical & Aerospace Engineering at West Virginia University (WVU), USA. He received his Ph.D. degree in Materials Science & Engineering from Zhejiang University, China in 1997. He has received the Benedum Distinguished Scholar Award, and the Alice Hamilton Award for Excellence in Occupational Safety & Health: Biological Category. He has won the WVU Statler College Outstanding Researcher Award twice. Dr. Wu's current research interest lies in chemical sensors and biosensors for health care and environment monitoring, photocatalysts and photoelectrochemical cells for solar energy harvesting. His research is funded by NSF, NIH and DOE. His papers were cited about 2,400 times in a single year 2016, achieving a total citation count of >12,200 times with H index of 56.



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