A Elsharif, J Nanomater Mol Nanotechnol 2018, Volume 7
DOI: 10.4172/2324-8777-C1-020

A Elsharif

Immam Abdulrahman bin Faisal University, Saudi Arabia

Gold Nanorod Coated Metal Semiconductor Interface to Study the Plasmonic Hot Electron Generation

It's been reported that sub bandgap photons absorbed with the plasmonic mode resonance on thin Au/TiO_2 metal/semiconductor photonic crystals could be injected to the semiconductor as hot electrons while photons absorbed with other modes could not [1,2]. In order to understand why plasmonic hot electrons could be injected across the metal/semiconductor interfaces, we have coated gold nanorods on the surface of the metal/semiconductor composite layer to incur plasmons at frequencies other than the plasmonic frequency of the photonic crystal structure (600 nm) we made. Au nanorods with 15 nm diameter and 45 nm length (aspect ratio 3:1) have localized surface plasmon (LSP) resonance frequencies at 530 nm (transverse) and 700 nm (longitudinal). We firstly used electrophoretic deposition (EPD) method to deposit nanorods on the metal semiconductor composite layers at different suspension densities to get the optimum gold nanorod density. Under 10V applied electric field, positively charged gold nanorods at the concentration of $6.52x10^{13}$ (#/mL) could deposit the metal semiconductor composite surface with the density of 230 #/μm^2, which was reasonably uniform and sparse over the surface of the photonic crystal, all lying horizontally to the surface. Photocurrent generation tests with the horizontally coated gold nanorods show only transverse mode plasmons could be injected into the semiconductor. This confirms our study that internal electric field in the direction normal to the metal-semiconductor interface can generate more hot carriers with enough momentum component to cross the Schottky barrier and improve the device's efficiency.

Biography

Asma Elsharif has completed her PhD in March 2009 from King Faisal University, Saudi Arabia. Her research area are Corrosion Inhibitors, Polymers and Nanotechnology (Energy Harvesting). She has conducted research with different Universities worldwide such as; Heidelberg University in Germeny, University of Melbourne in Australia and Cranfield University in UK. She worked as a visiting researcher in Cranfield University, UK 2013 and MIT, US at the Mechanical Engineering Department 2014-2016.

aelsharif@iau.edu.sa

Notes: