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Enhanced Broadband Photoresponse in Plasmonic Nanoparticles decorated ZnO Nanowire Film fabricated by Laser Ablation method[1] RAJIB NATH, DCMP MS, Tata Institute of Fundamental Research (TIFR), Mumbai, India, RISHI RAM GHIMIRE, RAJESH KR. NEOGY, ARUP K. RAYCHAUDHURI, S. N. Bose National Centre for Basic Sciences, Kolkata , India — ZnO is a high band gap semiconductor which is widely used as an UV photo-detector. However, one of the draw backs of ZnO based photo-detectors is its lack of response in the visible, in particular above a wavelength (λ) of 450 nm which limits its use as broadband photodetector. Here, we report that the photoresponse of ZnO nanowire (NW) based photodetector can be significantly enhanced in wide spectral range (350 to 650nm) using ligand free attachment of plasmonic Au-nanoparticles (NP) on its surface by laser ablation process. This simple fabrication method increases responsitivity (R) (2 to 4 order) of Au-ZnO device in a window of $500<\lambda<625$ nm in which bare ZnO-NW photodetector has very low R. The enhanced broad band photoresponse is strongly linked to the enhancement of the absorption in the spectral range of 300 nm to 700 nm due to Au-NP attachment. We found that both R and photocurrent decay time in Au-ZnO device can be tuned controllably by increasing Au NP concentration by just varying the no. of laser shots used for the ablation process. This simple, single step, laser ablation based plasmonic nanoparticle attachment process can be further utilized to make other semiconductor nanoparticle based devices.

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Rajib Nath
DCMP
MS, Tata Institute of Fundamental Research (TIFR), Mumbai, India

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