OSF15-2015-000039 Abstract Submitted

for the OSF15 Meeting of
The American Physical Society

Exciton Plasmon Interaction in Au coated Hybrid Organic GaAs Core Multi-shell Nanowire Heterostructures. MASOUD KAVEH, University of Cincinnati, QIANG GAO, CHENNUPATI JAGADISH, Australian National University, GERD DUSCHER, UniversityofTennessee , HANS-PETER WAGNER, University of Cincinnati — We investigate exciton energy transfer from semiconductor nanowires (NWs) to the Au nanoparticles in Au/Alq3 coated GaAs-AlGaAs-GaAs core-shell NWs using temperature- and intensity-dependent time-integrated as well as time resolved (TR) photoluminescence (PL). Organic-plasmonic NW heterostructures were fabricated by organic molecular beam deposition. PL measurements at 14K show emission peaks at 1.515 eV, 1.495 eV and 1.469 eV attributed to the free exciton, the carbon free to bound transition and tentatively to an emission from deeply trapped electron or hole states, respectively. Plasmonic NWs with a ˜10 nm thick Au coating but without Alq3 spacer layer reveal a significant reduction of the PL intensity for all emission bands compared with the uncoated NW sample. Organic-plasmonic NWs with the same Au coverage and an additional Alq3 interlayer of 5 or 10 nm thickness show a noticeably stronger PL intensity which increases with rising Alq3 spacer thickness. The PL quenching is mainly attributed to Forster energy-transfer from free GaAs excitons to plasmon oscillations in the deposited Au film. TR PL measurements support our interpretation by showing an increase in the exciton decay times as we increase the spacer thickness. Au coated NWs also reveal a strong polarization dependent absorption which is mainly due to the significant dielectric mismatch between the NWs and the adjacent vacuum environment.

Masoud Kaveh-Baghbadorani
Univ of Cincinnati

Date submitted: 26 Sep 2015 Electronic form version 1.4