Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Time Resolved Fluorescence Lifetime Imaging Analysis of MoS2/Graphene Heterostructures HUSEYIN SAR, Anadolu University, Electrical and Electronics Engineering, Turkey, AYBERK OZDEN, Anadolu University, Materials Science and Engineering, Turkey, CEM SEVIK, Anadolu University, Mechanical Engineering, Turkey, NIHAN KOSKU PERKGOZ, FERIDUN AY, Anadolu University, Electrical and Electronics Engineering, Turkey — For high-performance optoelectronic device applications, the lifetime of excitons of MoS2/Graphene (M/G) structures is aimed to be high in order to diminish any exciton recombination processes. The M/G structures were obtained by first transferring CVD grown MoS2 flakes on graphene film, and second by direct growth of the MoS2 flakes onto graphene. The excitonic and interface effects were studied using Raman Scattering, PL and fluorescence lifetime (FL) imaging (FLIM). FLIM of MoS2 flakes on SiO2/Si substrate shows that the FL is varying in the range of 0.3-0.45 ns, throughout a single flake, with higher lifetime at the edges. Contrarily, for M/G structures the PL intensity was observed to be quenched by a factor of $\sim$10, with a blue shift of $\sim$40 meV for the A-exciton. An important outcome was the throughout-the-flake uniform exciton lifetime on the transferred structures with a value of 0.33 ns. This is caused by charge transfer between MoS2 and graphene (2D peak shift in the graphene Raman spectra) and stress relaxation of MoS2 on graphene after the transfer process (significant downshift of E Raman peak of MoS2). As a result, the lifetime of the transferred MoS2 is uniform through all the flake surface and graphene does not decrease the FL of MoS2.

Huseyin SAR
Anadolu University, Electrical and Electronics Engineering, Turkey

Date submitted: 11 Nov 2016 Electronic form version 1.4