Charge transfer excitons in codeposited organic films

XIASHENG WANG, AJWARD MILHAN, HANS PETER WAGNER, University of Cincinnati

Charge transfer (CT) excitons play an important role in solar cells and organic light emitting devices. Such excitons are usually formed at the hetero-interfaces with an electron and hole residing in different materials. We studied the formation and recombination dynamics of CT excitons in co-deposited Alq3/PTCDA, TPD/Alq3, and TPD/PTCDA thin films that are grown by organic molecular beam deposition with various co-deposition ratios. (Alq3: Tris(8-hydroxyquinolinate)aluminium, PTCDA: perylene-3,4,9,10-tetracarboxylic-3,4,9,10-dianhydride, TPD: N,N’-Bis(3-methylphenyl)- N,N’-diphenylbenzidine.) The formation of CT excitons is associated with a quenching of the photoluminescence (PL) of the individual material. The PL spectrum shows a new emission peak at ∼750 nm for Alq3/PTCDA films and ∼700 nm for TPD/Alq3 which we tentatively attribute to the radiative recombination of CT excitons. The formation and decay time of the CT excitons is studied by time-resolved PL measurements using the technique of time-correlated single photon counting.

Hans-Peter Wagner
University of Cincinnati

Date submitted: 20 Nov 2009

Electronic form version 1.4