Photoluminescence quenching in blends of conjugated polymer with low-molecular acceptors

Graduate work of the 6 year student of the

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Annotation

This graduate work covers rightness of description photoluminescence quenching process (in blends of conjugated polymer MEH-PPV (poly[2-methoxy-5-(2`-ethylhexyloxy)-1,4-phenylene vinylene) with different types of low-molecular acceptors: trinitrofluorenone (TNF) , dinitroantraquinone (DNAQ) and modifications of fullerene C60) with the process of resonance energy transfer. First two acceptors produce a Mullikene type charge transfer complex (CTC) with conjugated polymer (CP). It makes absorption in the field of CP high-luminescence stronger. Fullerene C60 modifications can have strong absorption in CP high-luminescence field. In both cases strong absorption allows the energy transfer process from CP to acceptor or CTC.

Dependences of photoluminescence from acceptor concentration were measured (photoluminescence (PL) quenching curves). We used two methods of making samples (drop cast and spin coating). Difference between these two methods is in time of removing of solvent and it influences on clustering degree of blend components. Comparison of PL quenching curves for two methods of making samples allows to estimate the contribution of clustering into PL intensity.

In analysis we used a model of PL quenching that takes into consideration resonance energy transfer from donor to acceptor and from donor to donor. Last process influences on diffusion of excitons. Diffusion of exciton makes transfer nearly to acceptor easier and enlarge the probability of PL quenching. Using approximation of PL quenching curves with this model we got meanings of characteristic radius of energy transfer (Forster radius).

We invented a special method of measuring extinction of isolated molecules –modifications of fullerene C60.We detected a difference between optical absorption of this acceptors in solid phase and in solution.

We calculated Forster radiuses using meanings of extinction of acceptors in solid phase and in solution. We've got a good correspondence of meanings of Forster radiuses from model approximation and from theoretical calculation. It allows to make a conclusion that resonance energy transfer is dominating process leading to PL quenching .

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