PHYS 439

Chain length dependent energy transfer in single PPV derivative luminescent polymers during photo-bleaching

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Energy transfer efficiency in single long-chain MEH-PPV and rod-like DOO-PPV polymers was studied in terms of the experimentally measurable spectral shift by single molecule spectroscopy with double-port photon counting technique. Samples were prepared by dissolving in solvents with different polarity and spin-casting in a polystyrene matrix. Experimental results show that the energy transfer in rod-like polymers is inefficient. In contrast, within long-chain ones, the energy transfer is relatively efficient. However, the energy transfer in long-chain polymers is efficient only before significant quenching sets in. It becomes inefficient afterwards. On the other hand, changing from a polar solvent to a nonpolar solvent has little effect on the energy transfer efficiency relative to that coming from the change from a rod-like structure of the short-chain polymers to the coiled one of the long-chain polymers. Chain length is shown to dominate over solvent induced conformation changes in its effect on energy transfer within PPV polymers.

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