EXCITATION ENERGY TRANSFER IN POLYMER BLENDS FOR LIGHT-EMITTING DIODES AND LASERS

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Abstract

We present the realization of efficient, color-variable, organic/polymer electroluminescent (EL) and laser devices using the cascade excitation energy transfer. Fluorene-based light emitting polymers, poly(2,7-bis(*p*-stiryl)-9,9'-di-*n*-hexylfluorene sebacate) (PBSDHFS) and poly(9,9'-di-*n*-hexyl fluorenediylvinylene-*alt*-1,4-phenylenevinylene) (PDHFPPV), and a commercially available laser dye, 4-(dicyanomethylene)-2-methyl-6-(*p*-dimethylaminostyryl)-4H-pyran (DCM) comprised the three component blend system. Förster-type excitation energy transfer in the PBSDHFS/PDHFPPV (98w/2w) and PBSDHFS/PDHFPPV/DCM (98w/2w/2w) blends played an important role to achieve color-tunability as well as high efficiency due to reduced self-absorption loss and concentration quenching. When we excited the PBSDHFS/PDHFPPV binary blend film at 375 nm (the absorption peak of PDSDHFS), we observed a largely improved PL output at 475 nm: The integrated photoluminescence (PL) intensity was ~13 times as strong as that of the pure PDHFPPV film. And we also observed the efficient energy transfer from PDHFPPV to DCM in the PBSDHFS/PDHFPPV/DCM ternary blend. The energy migration among the components in the binary and ternary blends is confirmed by PL excitation spectra. This efficient energy migration among the components makes it possible to realize color-tunable efficient EL and laser devices.