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Time-resolved photoluminescence study of excitons in thin PTCDA films at various temperatures

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Abstract

In the present work excitons in thin 3,4,9,10-perylene tetracarboxylic dianhydride (PTCDA) films are studied by means of time-resolved photoluminescence (TRPL) in the temperature range from 10 to 300 K. The obtained temperature dependence of different recombination channels, arising from an indirect minimum of the Frenkel exciton dispersion, different types of self-trapped excitons and relaxed excited monomer states, are compared to the corresponding PL recombination channels for single crystals. The Frenkel excitons (FEs), the slow PL channel, the excimer decay times, and the PL intensities reveal a similar temperature dependence like in the single crystals, while the contribution of the charge-transfer exciton (CTE) is twice as large in films.

Author Keywords: PTCDA; Time-resolved photoluminescence; Frenkel excitons; Self-trapped excitons

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