THE ROLE OF COULOMB INTERACTION IN PHOTOINDUCED THERMALLY STIMULATED CURRENT AND LUMINESCENCE IN ORGANIC SEMICONDUCTING POLYMERS

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S u m m a r y

Photoinduced thermally stimulated current (TSC) in conjugated polymers can be controlled by either the thermally activated release of Coulombic unbound (free) trapped charge carriers or by the dissociation of coulombically bound pairs of charges (CPs). In the present work, both TSC regimes have been observed experimentally by combining TSC and thermally stimulated luminescence (TSL) studies in several conjugated polymers. We found that (i) the above-mentioned TSC regimes are determined by the dominant mechanism of charge generation during the optical excitation and, in some conjugated polymers, the regimes can be switched by changing the polarity of the load bias, and (ii) TSC and TSL temperature spectra are similar, when TSC are controlled by the release of unbound charge carriers. However, they are substantially different, when TSC is controlled by the dissociation of CPs, since the Coulomb binding energy strongly affects the dissociation of CPs into free charge carriers. Therefore, it changes the apparent activation energy of TSC. The field effect is explained by a unified model of hopping TSL and TSC in disordered organic semiconductors.