Nonlinear Spectroscopy Study in Conjugated Polymers with High Red-Green Emissivity

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Polymeric light emitting devices (PLEDs) have gained significant attention owing to their easy production and high fluorescence emission at red, green, and blue (RGB) spectral regions. Also, they are used in industrial applications such manufacturing of cellphone and TVs screens. Moreover, the combination of RGB emission can be used for white light generation (WLG) [1] looking at solid-state illumination applications (SSI). In addition, the alternating σ and π bonds present in conjugated polymers lead to high polarizabilities, leading to large values of multiphoton absorption cross-section, that combined with the high fluorescence emission could be employed to fabricate new nonlinear optical devices. In this way, here it is reported a nonlinear optical investigation in three PLEDs (denoted as RP1, RP2 and YP) that were synthesized aiming RGB-type devices. For RP1 and RP2, a strong fluorescence emission at 633 nm and 645 nm, respectively, was observed, while YP emitted at 538 nm. Besides, photophysical parameters such molar absorption coefficient (ε) and fluorescence lifetime (τ_{flu}) were also determined. Results of ε showed two electronic states for all PLEDs, centered around 546 nm, 530 nm and 450 nm, respectively for RP1, RP2, and YP. . The two-photon absorption cross-section was determined through the tunable femtosecond Z-Scan technique [2]; for RP1 and RP2 three excited states accessible by 2PA were verified. On the other hand, for YP, just one 2PA state was found. Values of 2PA cross-section at the higher excited state (*ca* 770 nm) for RP1 was 2350 GM, for RP2 (*ca* 760 nm) 1190 GM, and for YP (*ca* 720 nm). As a consequence of high fluorescence emission, it was possible to verify a fluorescence triggered through 2 and 3 photon absorption for RP1 and RP2 (excitation wavelength at 900 nm and 1500 nm). For YP, a fluorescence signal triggered by 2, 3, and 4 photon absorption was verified, with excitation wavelength at 700 nm, 1100 nm, and 1400 nm.

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