11th International Conference on Advanced Materials
Rio de Janeiro Brazil
September 20 - 25
ICAM2009

Photo-physical properties of a new luminescent polymer

G. Santos[(1)*], F. J. Fonseca[(1)], I. Grova[(2)], L. Akcelrud[(2)], A. M. Andrade[(3)], L. Rino[(4)] and L. Pereira[(4)]

(1) Laboratório de Microeletrônica, Departamento de Engenharia de Sistemas Eletrônicos, Escola Politécnica da Universidade de São Paulo, Av. Prof. Luciano Gualberto, trav. 3, nº 380, CEP 05508-900, São Paulo – SP, Brasil, e-mail: gsantos@lme.usp.br
(2) Laboratório de Polímeros Paulo Scarpa, Departamento de Química, Centro Politécnico da UFPR – Universidade Federal do Paraná, CP 19081, CEP 81531-900 Curitiba, Paraná – PR, Brasil
(3) Instituto de Eletrotécnica e Energia – Universidade de São Paulo, CEP: 05508-900, São Paulo – SP, Brasil
(4) Departamento de Física e i3N – Instituto de Nanoestruturas, Nanofabricação e Nanomodulação, Universidade Universidade de Aveiro, 3810-193 Aveiro, Portugal

* Corresponding author.

Abstract – A new yellow luminescent polymer was synthesized and characterized. The main emission spectral region is the yellow – green showing a vibronic structure with quantum separation of 10 – 40 meV suggesting a complex excitation – de-excitation system. The main emission is centered at 517 nm and shows a very fast lifetime (less than 20 ns). A physical discussion about the internal energy process is made in order to explain that complex behavior.

New conjugated polymers appear as a fundamental development for materials science and practical applications, in special for opto-electrical devices. With the advance of organic electronic, the research of the photo-physical properties of those polymers is the first and perhaps the most important tool to extract the necessary information in order to planning further developments.

In this work, we present photo-physical study of a new luminescent polymer, hereinafter called LaPPS16 (see Fig. 1). All the experiments were made with the sample in solid state encapsulated into a quartz holder, at room temperature.

The photoluminescence (PL) spectrum is formed by three non-resolved bands with maximums at approximately 480, 517 and 550 nm. The relative intensity of these bands changes with excitation: using excitation at 355 nm (with laser pulse of 6 ns) the 550 nm band is not observed, whereas for all other excitations this band is clear, although the relative intensity is apparently not correlated with the excitation energy. The 517 nm band dominates all the PL spectra (Fig. 2). The photoluminescence excitation spectra (PLE) recorded at them maximum of the PL spectra, shows that the related emission is enhanced for the energy absorption near 480 nm. The more receptive state for this absorption is that origin the 517 nm emission, i.e., the dominant transition in the PL. With these results, we can conclude that the main absorption band is formed by a progressive vibronic emission between 425 – 490 nm with the vibration states separated by quantum between 10 – 40 meV. Another secondary band, corresponding to the high energy phonon absorption is observed at 277 nm. The preliminary time-resolved PL results (excitation at 355 nm with a laser pulse of 6 ns) shows that the lifetime of the three states for the observed bands is similar and relatively fast (< 20 ns falling in the equipment resolution)

The physical discussion of results, taking into account the electronic properties of the polymer is made.

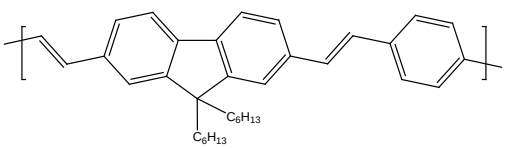

Figure 1: Chemical structure of LaPPS16 polymer.

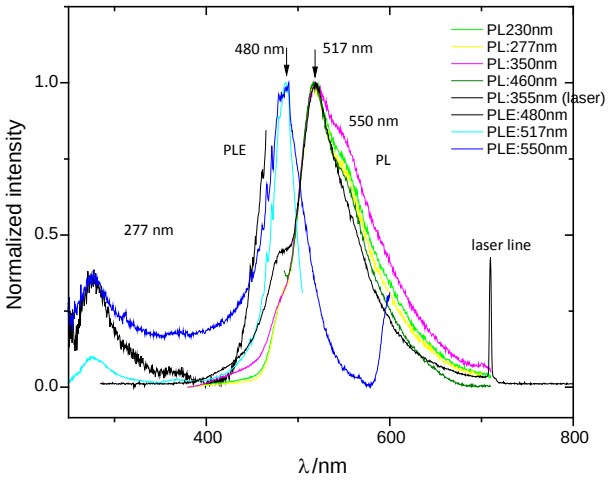

Figure 2: PL and PLE of the LaPPS16 polymer powder at room temperature.