Dispositivos foto e eletroluminescentes com materiais poliméricos.

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Introdução

Since the discover of organic electroluminescent devices (OLED) and in particular with the development of polymeric electroluminescent devices (PLED) significant effort has been expanded in developing new materials and systems that includes new polymers, copolymers or mixture of components.[1-3] The use of polymer blends perhaps represents a less expensive approach to prepare materials for new polymeric electroluminescent devices with improved performance. Here we show three examples of materials undergoing electroluminescence (a conjugated-nonconjugated PPV-type copolymer, poly(methylmethacrylate-*co*-9-anthryl-methyl-methacrylate)s and (styrene-*co*-acrylic acid) ionomer/conjugated MEH-PPV blends) and we compare the profiles of the photoluminescence and electroluminescence emissions.

Resultados e Discussão

The conjugated-nonconjugated multi-block copolymer synthesized was the poly[1,8-octanedioxy-2,6-dimethoxy-1,4-phenylene-1,2-ethenylene-1,4-phenylene-1,2-ethenylene-3,5-dimethoxy-1,4-phenylene]. Since this is a conjugated-non conjugated copolymer, the critical conjugation length is very well controlled being equal to two and half phenylene-vinylene units. Because of this conjugation length, this copolymer emits in the blue region of the spectrum. Comparing the emission of the copolymer in solution and in the solid state allowed us to conclude that the emissive center in solid the emission comes from associated forms, such as ground-state dimers and/or excimers.

The light emitting properties of copolymers of methyl methacrylate and 9-anthryl methyl methacrylate, poly(MMA-co-MMAnt), are also in the blue region since the emitting groups are anthracenyl that are attached to the main chain as lateral moieties. We observed that only those copolymers with very high relative concentration of anthracenyl groups are electroluminescent while all of them undergo photoluminescence. Therefore, the photophysical properties are strongly controlled by the intrachain architecture (intrachain chromophore population and distribution) as well as by the interchain interactions: it is optimized for copolymers containing one anthryl group interspaced between 2 or 4 four methyl methacrylate units: and it has to be larger than that of the homopolymer, PMMAnt.

The last example that we should present in this workshop is the electroluminescence of poly[2-methoxy-5(2'-ethylhexyloxy)-*p*-phenylenevinylene] (MEH-PPV) blended with poly(styrene-*co*-acrylic acid-*co*-1-pyrenylmethyl methacrylate) (SAA) in several compositions, from 0 wt% to 100 wt% in mass of MEH-PPV. Device performances were compared: that using MEH-PPV has a turn-on voltage of 3.5 V, luminance of 500 cd/m^2 and current density of 430 mA/cm^2 at 5 V, while the MEH-PPV blended with 50 wt% styrene-acrylic copolymer showed a turn-on voltage of 2.5 V, a luminance of 2300 cd/A and a current density of 640 mA/cm^2 at 5 V.

Conclusões

Here we showed three systems that undergo electroluminescence and photoluminescence and we discuss the correlation of these processes and the structural properties of the polymer chain. In the last case we also demonstrate that the efficiency of both processes are controlled by the morphology of the system.

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