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SYNTHESIS AND CHARACTERIZATION OF POLY(1,4-PHENYLENEVINYLENE) DERIVATIVES

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Semi-conducting organic polymers offer numerous advantages to replace the well-established display technologies, based on cathode ray tubes and liquid crystal displays, for the fabrication of electroluminescent devices. On the one hand, the technological process of polymer is easy and fast, so that it can be used for producing large area of flexible displays at low cost. On the other hand, emitting color tunability over the full visible range is particularly interesting, besides of low operating voltage and fast response time.

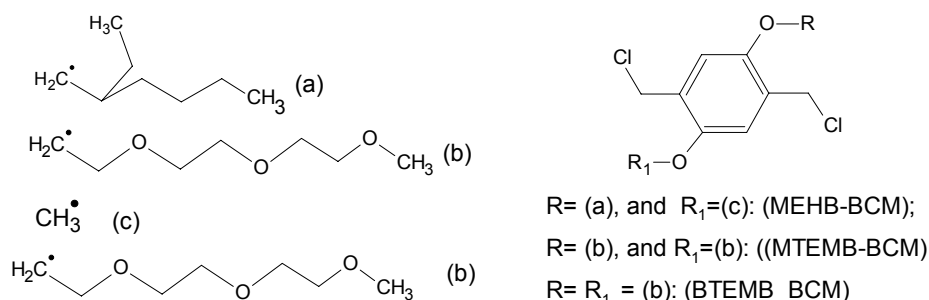
Poly(1,4-phenylenevinylene) (PPV) and its derivatives have attracted much attention in recent years due their interesting electric-optical properties for application in organic emitting diodes (OLEDs)¹. In this regular electroluminescent device, the active polymeric layer is sandwiched between electrodes, generally an ITO (Indium Tin Oxide) as anode, and a metallic cathode, typically an aluminum layer.

A new concept of device, the organic electro-chemical cell (OLEC), uses as active layer a blend of a luminescent polymer and one ion conductive (a polymer electrolyte)². An important advantage of OLECs is the reduced operating voltage, due the formation of a p-n junction within the active layer, and the uncompensated accumulation of anions and cations at each interface, which suppresses the barrier height for electron and hole injection. The main limitations of this kind of device are due to the time required to reach a steady state, which depends of the ionic conductivity of the layer, and to a lack of long term overall stability. The blends of conjugated polymer with the solid electrolyte, usually poly(ethylene oxide) (PEO), used as active layers of OLECs, are in general immiscible leading to phase separation³.

As the electric-optical properties of OLECs depend strongly on the film morphology of emissive layer, a strategy to reduce this problem involves the attachment of oligo(ethylene oxide) side chains to the MEH-PPV backbone, by copolymerization.

These oligoether groups act as compatibilizing functions between the PPV backbone and the PEO of blend, improving the emissive layer performance in the OLECs.

This paper presents the synthesis and characterization of a series of alkoxy-substituted poly(1,4-phenylenevinylene), and related copolymers containing triethoxymethoxy side chains, in order to be used in OLECs active layer. These polymers were synthesized from their 2,5-bis (chloromethyl) benzene monomers through Gilch reactions adapted by Wudl⁴. These derivatives are copolymers obtained from 1,4-bis(chloromethyl)-2,5-bis(triethoxymethoxy) benzene (BTEMB-BCM) and 1,4-bis(chloromethyl)-2-methoxy-5-(triethoxymethoxy)-benzene (MTEMB-BCM), with 1,4-bis(chloromethyl)-2-methoxy-5-hexyloxy benzene (MEHB-BCM), monomer of the usual polymer MEH-PPV. The scheme1 illustrates these monomers. The polymers were characterized with UV-visible, FT-IR, and photoluminescence.



Scheme1- Monomers synthesized to obtain the PPV derivatives

Results of absorption spectra analyses showed that the λ_{max} of copolymers are red shifted relatively to pure MEH-PPV(λ_{max} -502nm). It is probably due to the effect of dilution occasioned by oligoether on the comonomer, reducing interchain interactions.

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