11th International Conference
on Advanced Materials

Rio de Janeiro Brazil
September 20 - 25

ICAM2009

Bandgap in one thienylene-phenylene conjugated polymer

S. L. Nogueira[1*], H. Santos[1], A. Marletta[1], N. M. Barbosa Neto[1] and R. A. Silva[1]

[1]*Instituto de Física, Universidade Federal de Uberlândia, CP 593, 38400-902, Uberlândia - MG, Brazil*

Abstract – The bandgap in this conjugated polymer would allow to control of its structural and optoelectronic properties and observed altrough of the photoluminescence and optical absorption spectra or cyclic voltammogram.

Conjugated polymer has attracted intense interest in the last two decades, owing to their unique combination of characteristics: electronic, optical, properties of semiconductors and metals, and processing advantages of polymers. In numerous applications the control of the bandgap is a key parameter, for instance, the nature of the electroluminescence signal in light-emitting diodes and the efficiency of light absorption in solar cells[1]etc.

The bandgap of conjugated polymers is usually fairly larger, related with this the motivation of this work is based on calculus of the bandgap (Eg) in conjugated polymers. The “optical bandgap” of π-conjugated organic molecules is determined by several parameters, among which the electronic transition energy of the unsubstituted planar backbone contributes the most, upon photoexcitation. However, other parameters also have a significant impact, with contributions that can sum up to 1 eV, i.e., about 50% of the absolute value of E_{gap},as geometry, distortion and effects of chemical substituents [2].

In this work we perform studies on the better determination of optical bandgaps of one π-conjugated polymer from experimental spectrum with the purpose of discussion about effects on the optical properties and concept about gap in this conjugated polymer. The chosen material was thienylene-phenylene conjugated copolymer. The samples were prepared in solution and in films using the layer by layer technique and deposited on quartz substrate for optical measurements. The system was characterized by cyclic voltammetry since a polymer can be made conductive by oxidation (p-doping) and/or, less frequently, reduction (n-doping) of the polymer either by chemical or electrochemical means, generating the mobile charge carriers as showed in the figure 1 where was obtained 0.37 V/SCE for the HOMO energy in this conjugated polymer. Through optical absorption and photoluminescence spectra were obtained different methods in the calculus of the band gap as such in the figure 2. Spectra Intersection and extrapolation in the zero absorption and high peak (0-0) in the photoluminescence spectrum were carried out in order to estimate the bandgap value.

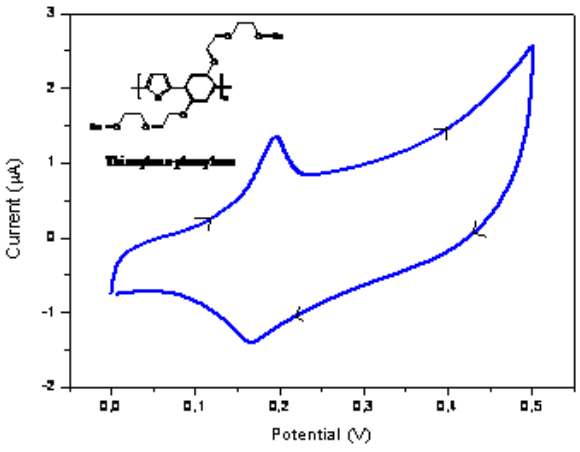

Figure1: Shape of a cyclicvoltammogramfor a Thienylene phenylenecopolymer

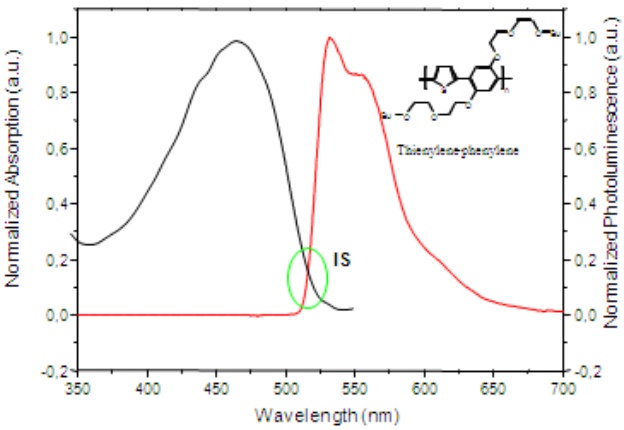

Figure 2: Optical absorptionand photoluminescence for a Thienylene-phenylenecopolymer

References

[1] S. Yang et al. / Synthetic Metals 141, **2004**, 171–177
[2] J. Gierschner et al. Adv. Mater. **2007**, 19, 173–191

Acknowledgements

CAPES, CNPq, FAPEMIG.