

E.I.S evaluation of Chitosan– Polypyrrole Film

E. E. Feistauer⁽¹⁾, P. Aranda⁽²⁾, E. Ruiz-Hitzky⁽²⁾, O. L. Alves⁽³⁾, I. F. Gimenez⁽⁴⁾, L. S. Barreto^{(1)*}

- (1) Núcleo de Ciência e Engenharia de Materiais, Universidade Federal de Sergipe, Av. Marechal Rondon s/n, São Cristóvão, SE, ledjane.ufs@gmail.com.br
 (2) Instituto de Ciencia de Materiales de Madrid, CSIC, Cantoblanco, 28049 Madrid, Spain. Eduardo@icmm.csic.es
 (3) Departamento de Química Inorgânica, Instituto de Química, UNICAMP, oalves@iqm.unicamp.br
 (4) Departamento de Química, Universidade Federal de Sergipe, Av. Marechal Rondon s/n, São Cristóvão, SE, gimenez@ufs.br
 * Corresponding author.

Abstract – Conductivity of a polypyrrole – chitosan film was assessed by electrochemical impedance spectroscopy. The films were about 35 μm of thickness. The measurement were done from 25-145 $^{\circ}\text{C}$ under inert atmosphere. The samples were characterized by thermal analysis, infrared spectroscopy, Raman Spectroscopy, scanning electronic microscopy. The Electrochemical Impedance Spectroscopy (EIS) measurements were made using a Solartron 1260 frequency response analyzer and a Solartron 1260 electrochemical interface. The results conductivity values to the chitosan free film were the order of 6.92×10^{-6} to 3.67×10^{-7} S/cm, while the chitosan-polypyrrole film showed values of 7.61×10^{-6} to 4.65×10^{-4} S/cm.

Conductivity of a polypyrrole – chitosan film and free chitosan film was assessed by electrochemical impedance spectroscopy. The polypyrrole-chitosan film were prepared by imersion of the chitosan free film on FeCl_3 solution and polypyrrole solution. The films were characterized by powder X-ray diffractometry using a RIGAKU diffractometer with $\text{Cu K}\alpha$ ($\alpha = 1.542 \text{ \AA}$) source, Fourier transform infrared FTIR) spectra. Thermogravimetric analysis measurements (TG) were performed using a TA SDT 2960 instrument with 10 $^{\circ}\text{C}/\text{min}$ heating rate up to 500 $^{\circ}\text{C}$ under N_2 flow (100mL/min) in platinum pans, and also by scanning electron microscopy (SEM). For impedance measurements samples of 35 μm thickness were placed in a Solartron 1260 impedancimeter in the 1Hz to 13MHz frequency range from 25 $^{\circ}\text{C}$ to 145 $^{\circ}\text{C}$. Data were treated with Zview software.

A preliminary evaluation of the electrical properties of the film was carried out yielding the Nyquist plot, not shown. The results of conductivity to the chitosan free film were the order of 6.92×10^{-6} to 3.67×10^{-7} S/cm. The chitosan-polypyrrole film showed values of 7.61×10^{-6} to 4.65×10^{-4} S/cm, Figure 1, an electrical conductivity in the range of semiconductors. Further studies are in progress to evaluate the dependence of conductivity with film thickness and also a sensor development. We emphasize that the material presented interesting conductive properties, in addition to potential applications of the material in sensors and electronic devices [1,2].

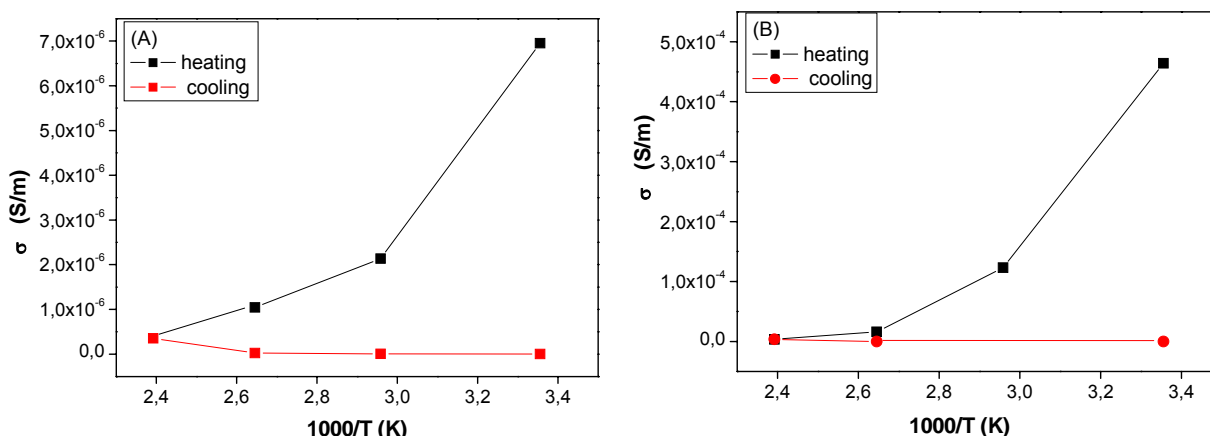


Figure 1. (A) Conductivity of chitosan free film; (B) Conductivity of chitosan-polypyrrole film

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