Electrocopolymerization of Indole and Thiophene: Conductivity-Peak Current Relationship and In Situ Spectroelectrochemical Investigation of Soluble Co-Oligomers

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Abstract:

Electropolymerization of indole (IN) in the presence of thiophene (Th) was followed by in situ and ex situ spectroelectrochemical studies. A correlation between absorbance (390 nm) and charge (at 600 mV) values indicated that oligomeric species were formed in solution, and similar results were found with in situ measurements. The increase in conductivity by the incorporation of Th into polyindole was about 60 times for a feed ratio n_{IN}/n_{Th}=1: 10 and 19 times for n_{IN}/n_{Th}=1: 1. Similar effects were also observed during in situ spectroelectrochemical measurements of copolymer formation. It was also found that the cyclic voltametry peak potentials for the electrogrowth of copolymer films were closely correlated to the conductivities of the corresponding films (measured separately by four-point probe method), thereby allowing us to use the peak potential currents to predict the final copolymer film conductivities during the electrochemical growth process. The T_g value of the polymer also increased with the incorporation of Th. The results strongly suggest that IN and Th copolymerize on the electrode surface as well as in solution.

Keywords: Conductivity; Cyclic voltametry; Electrochemical polymerization; Indole-thiophene copolymer; Spectrophotometric measurements

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