ELECTROADSORPTION CHARACTERISTICS AND ORIENTATION MODELS OF THIOPHENE AND 3-METIL THIOPHENE ON SMOOTH PLATINUM ELECTRODE IN ACIDIC MEDIA

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The many conjugated conducting polymers have been proposed in the literature, on account of their high electroactivity good reversibility and chemical stability for various electrochemical reactions. Thus polypyrrole (PPy), polythiophene (PTh) and polyaniline (PAn) are the most widely used electron conducting polymers in electrochemical research. Among these materials, PTh is one of the most attractive and extensively studied in view of its several applications, including batteries, sensors, electrochromic devices and electronic devices. Electrochemically generated polythiophene films are advantagenous for these applications as they show a good stability to oxygen and moisture in both the undoped and doped forms. Polythiophene is known to be stable in acid electrolytes. The conductivity of these polymers is about 100 $\Omega^{-1}.cm^{-1}$ in doped state, but the resistivity increases by nine orders of magnitude when the polymer is not doped. The polymer is readily deposited on conducting substrates by electropolimerization of the monomer. The chemical and physical properties of the film are dependent upon factors such as pH, charge and potential.

The electropolimerization mechanism is believed to involve the initial adsorption of the monomer on to the electrode surface. Though there is much work aiming at the elucidation of polythiophene film formation mechanism, we have scant knowledge on the adsorption characteristics and orientation of its monomer, thiophene on the electrode surface.

The main purpose of this work is to establish different criteria for the electroadsorption of thiophene and its derivative 3-metil thiophene on a smooth polycrytalline platinum electrode. Adsorbed molecule orientation may be determined using a classical method by comparison of the molecular areas corresponding to measured coverage with values calculated for various possible orientations. Molecular areas may be expressed in terms of the electrons per number of Pt sites occupied by an adsorbed molecule. The number of electrons per site for an adsorbed molecule is potentially a function of each variable of the interfacial system, such as electrolyte, concentration of adsorbed (dissolved) material, potential, temperature, pH, electrode material and surface structure. This work explores some of these factors in detail. The results may be helpful when considering the film properties from the point of view of growth properties of monomers such as their adsorptions and orientations.

References

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