

ELECTROCHEMICAL OXIDATION OF 2-AMINOTHIAZOLE ON SnO₂ ELECTRODE

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Conducting polymers have been a subject of intensive research, since their discovery in 1970s, due to their intriguing electronic and redox properties and numerous potential applications in many fields – as biosensors, corrosion inhibitors, ion sensors, in electrochromic display devices and electrochemical batteries [1, 2]. Poly(2-aminothiazole) (PAT) is an electrically conductive aromatic conjugated polymer that has a lot of valuable properties, in particular anticorrosive, antimicrobial and antitumor activities, heavy metal sensing applications [3, 4].

Several strategies were reported for the nanostructured conducting polymers synthesis, including template-based, template-free and physical approaches, for example, electrospinning. The electrochemical polymerization technique is very useful for producing thin polymer films on different surfaces, because of its simplicity. This method enables to influence the resulting polymer properties by reaction conditions. In addition, the polymer films can be synthesized directly on the electrode surface. Moreover, electrochemical synthesis technique allows obtaining a simultaneously doped conductive polymer, the deposition of insoluble polymers, uniform coating and easy electrochemical control of the thin thickness.

In this study, the conditions of 2-aminothiazole electrodeposition on the optical transparent electrode, covered with conductive SnO₂ layer, have been investigated. Thin films of PAT were obtained from aqueous solution of 2-aminothiazole (AT) in cyclic voltammetry mode at the presence of sulfuric or oxalate acid as electrolyte. Polymerization mechanisms including the oxidation and reaction of -NH₂ group were suggested for the electrochemical polymerization of aminothiazole and its derivatives [1, 2]. The multisweep cyclic voltammogram of AT showed that electrooxidation of AT take place during first potential sweep at the peak potential $E = 1.0$ V (versus Ag/AgCl reference). This peak disappeared after the first cycle and in second – a new peak at $E = 0.7$ V appeared. The peak current and potential value did not change in subsequent cycles. At the end of the electrolysis, a light yellow-brown polymer was formed on the working electrode surface.

The optical absorption spectra of PAT films were studied. Beside absorption near 370–380 nm (π - π^* transition between π -bonding to an antibonding π orbital) in it has been observed broad absorption band at around 570 nm, which can be assigned to n - π^* transition in the conjugated polymer. Also, the influence of doping with ferric compounds ($K_3[Fe(CN)_6]$, $FeCl_3$) on PAT absorption spectra, both by chemical and electrochemical methods, was established. The obtained results will be used for development new sensor films for heavy metals and toxic gases detection.

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