Матеріали Міжнародної науково-технічної конференції.
Фундаментальні та прикладні проблеми сучасних технологій – Тернопіль 19-21 травня 2015.

УДК 544.023.2:722.5 547.741+676.026.723.2

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STRUCTURE AND MORPHOLOGY OF POLYPYRROLE FILMS ON THE SURFACE OF POLYETHYLENE TEREPHTHALATE SUBSTRATE

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СТРУКТУРА ТА МОРФОЛОГІЯ ПЛІВОК ПОЛІПІРОЛУ НА ПОВЕРХНІ ПОЛІЕТИЛЕНТЕРЕФТАЛАТУ

Formation of polypyrrole (PPy) films on large scale polymeric substrates of different nature is an actual problem, that is of practical importance. Simplicity of chemical synthesis PPy and its high affinity for surfaces prepared polymers allows realizing one of the areas of surface modification of polymer film substrates, including films based on polyethylene terephthalate (PET) *in situ*, that is during the chemical oxidation of pyrrole (Py) [1, 2].

Provided of respective surface preparation part of PPy, which is formed in the volume of the reaction medium, is deposited on the surface of PET films, which are immersed in the polymerization solution, forming on their surface films of different thickness, structure and morphology. Thus received films can be used in many fields, such as chemo- and biosensors, electronics, and more.

Deposition of PPy films on PET film substrates was performed by oxidation of different concentrations of pyrrole $(NH_4)_2S_2O_8$ in aqueous solutions of 0,5 M oxalate (OA) and citrate (CA) acids. The structure and morphology of PPy films on PET substrate were studied using X-ray, ultraviolet and visible, infrared spectral analysis and electron micrographs of surface films.

It is shown that the structure of PPy films in doped form is amorphous-crystalline, due to the formation during synthesis of polypyrrole salt (oxalate and citrate of polypyrrole), mainly with the $\alpha\alpha'$ compound of monomer molecules in the macromolecular chain. The obtained films of polypyrrole are continuous, which was confirmed by scanning electron microscopy images and measuring the surface resistance of the films. PPy films on PET contain hemispherical aggregates of PPy delocalized over the surface of the film.

The nature of the absorption bands by changing concentration of pyrrole in the initial reaction solution, and the nature dopant acid practically does not change, in these conditions of synthesis growth of optical density is traced. Analysis of the absorption spectra of PPy films, which were deposited on PET, in the presence in the reaction mixture oxalate and citrate acid reveals, that the density of of PPy films or film thickness of PPy is different – different optical density of characteristic peaks.

The choice of synthesis conditions, dopant acid allows to obtain on the surface of polymer substrates conductive film of polypyrrole of different thicknesses with some spectral characteristics and physico-chemical properties.

1. Maiti S., Das D., Sen K. Characterization of electro-conductive fabrics prepared by in situ chemical and electrochemical polymerization of pyrrole onto polyester fabric // Mat. Sci. Eng. B. – 2014. – V. 187. – P. 96–101.

2. Kaynak A., Najar S.S., Foitzik R.C. Conducting nylon, cotton and wool yarns by continuous vapor polymerization of pyrrole // Synth. Met. – 2008. – V. 158, N 1–2. – P. 1–5.