

**Р6 ПРОДУКТИ ОРГАНІЧНОГО СИНТЕЗУ, ПОЛІМЕРИ  
І КОМПОЗИЦІЙНІ МАТЕРІАЛИ  
ORGANIC SYNTHESIS PRODUCTS, POLYMERIC MATERIALS  
AND COMPOSITES**

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**SYNTHESIS AND CHARACTERIZATION OF PROTON-CONDUCTIVE  
POLYMER AND POLYMER-INORGANIC MEMBRANES**

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Polymer and polymer-inorganic materials find fast growing application in modern technologies, in particular, as solid proton-conductive membranes in fuel cells. Recently, polymer hydrogel membranes attract much attention. They contain a large number of micro- and nanopores enclosing liquid phase, which serve as channels for ion migration. This provides high ionic conductivity of hydrogels.

Considerable ionic conductivity of polymer membranes may be also caused by the presence of functional groups with high ability to dissociation in polymer composite structure. The best ability to dissociate and, consequently, the highest ionic conductivity are provided by sulphogroups.

In this paper, polymer membranes have been obtained via radical photoinitiated copolymerization of acrylamide, acrylonitrile and 3-sulphopropyl acrylate potassium salt. The reaction was carried out in thin films by UV irradiation of mercury-quartz lamp. The intensity of irradiation was 14 W/m<sup>2</sup>. 2,2-dimethoxy-1,2-diphenylethane-1-on (IRGACURE 651) was used as photoinitiator. The content of comonomer containing sulphogroup was varied in the range 5 - 20% w. of the total mixture of comonomers.

Using sol-gel method of synthesis polymer-inorganic composites have been obtained in the form of thin films. For this purpose sol-gel system (SGS) tetraethoxysilane-ethanol-water in appropriate amounts were added to the above-mentioned mixture. The process of photoinitiated copolymerization was carried out similarly. The content of SGS in compositions was 5 - 20%. The obtained films were washed in sufficient amount of distilled water to remove unreacted substances. All membranes have high water uptake (> 40%).

To determine thermal stability of polymer and polymer-silica membranes thermogravimetric and differential thermal analyses of samples were conducted by means of Derivatograph Q-1500D in the temperature range of 20 - 450°C. According to obtained data, mass loss of samples due to destruction of sulphogroups, cross-links and following destruction of functional groups take place at temperatures above 200°C. Thus, synthesized membranes can be used in fuel cells in the temperatures range above 200°C.