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MIXED MATRIX MEMBRANE BASED ON PVA MODIFIED WITH FULLERENOL FOR PERVAPORATION SEPARATION OF ACETIC ACID-WATER MIXTURE

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ABSTRACT

Membrane processes have been developed for various applications. Pervaporation is one of the developing membrane technologies that can be used for various industrial separations as separation of azeotropes mixtures, mixtures of isomers, water-containing mixtures, etc. Development of this technology using membrane processes requires a search for new materials and creates the membranes with high transport characteristics. One of the most promising directions in this area is the modification and functionalization of polymers known types of nanoparticles. In the present work a low-hydroxylated fullerene has been used as a modifier and a cross-linking agent for polyvinyl alcohol.

Keywords: PVA, pervaporation, fullerenol, nanoparticals.

INTRODUCTION

The aim was to study the effect of fullerenol $C_{60}(OH)_{12}$ on transport and physico-chemical properties of polyvinyl alcohol (PVA). Different treatments are used for crosslinking of composite membrane as physical and chemical treatment. In this work physical (thermal) treatment was used. Structural and physico-chemical properties of the membranes were studied by various physical and chemical methods of investigation as thermogravimetric analysis, spectroscopic methods, scanning electron microscopy, differential scanning calorimetry and sorption experiments. The transport properties of mixed matrix membranes were studied under water treatment of mixture acetic acid-water during pervaporation. Pervaporation experimental was studied at different temperature.

RESULTS AND CONCLUSIONS

It has been shown that the introduction of fullerenol in a polyvinyl alcohol matrix leads to the significant change and the improvement of membrane properties due to the changes in the structure and morphology.

Scanning electron microscopy (SEM) micrographs have already shown significant changes of internal structure after modification. The SEM micrographs of cross-sections of membranes based on PVA and PVA-fullerenol composites are presented in Figure 1. These pictures demonstrate significant changes of the internal structure of membrane with the rise of fullerenol concentrations in polymer PVA matrix under different closs-linking conditions.

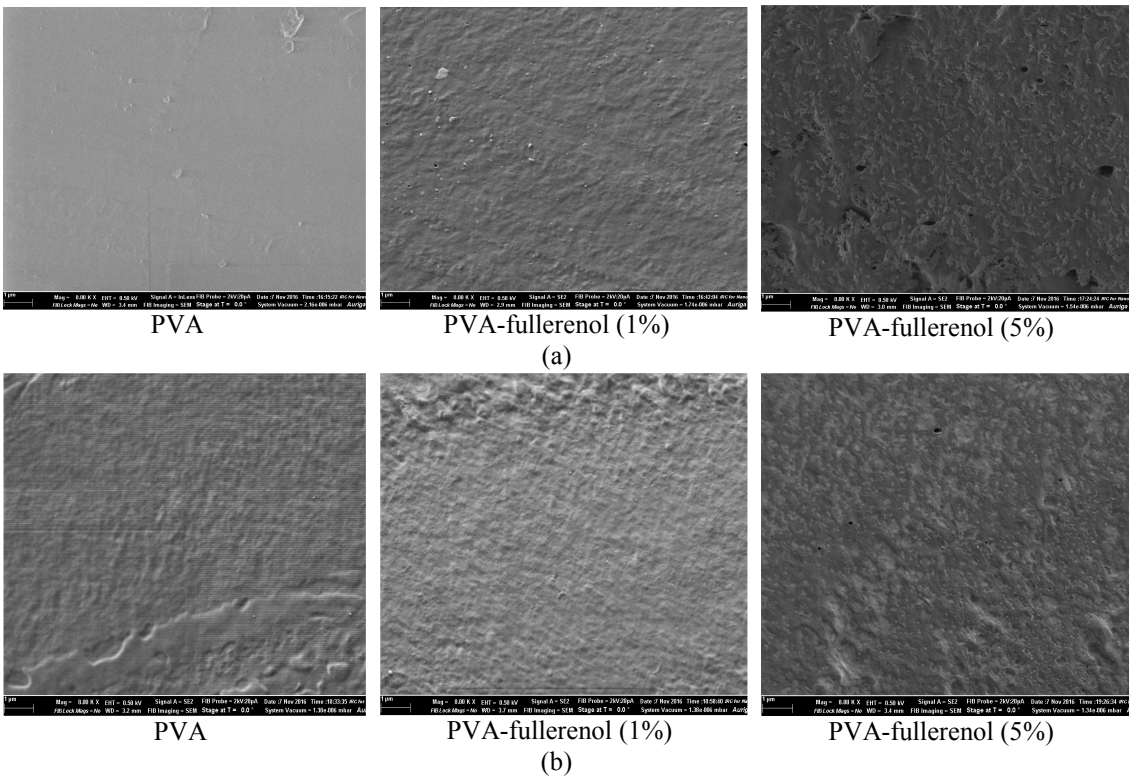

Fig. 1 - SEM micrographs of the cross-sections of the thermally treated membranes based on PVA and PVA-fullerenol composites at 140^0C: during 100 (a) and 420 (b) minutes

Changes in the internal structure strongly influence on the transport membrane properties. Novel supported membranes developed in the frame of this work had high transport characteristics.

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