Proceedings of the 7th International Conference on Mechanics and Materials in Design
Albufeira/Portugal 11-15 June 2017. Editors J.F. Silva Gomes and S.A. Meguid.
Publ. INEGI/FEUP (2017)

PAPER REF: 6649

PERVAPORATION DEHYDRATION BY PVA - FULLERENOL - CHITOSAN MIXED MATRIX MEMBRANES

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ABSTRACT

The aim of this work is to investigate the impact of blending of PVA with chitosan and low-hydroxylated fullerene $C_{60}(OH)_{12}$ (fullerenol) on the physical, chemical and transport properties of polyvinyl alcohol (PVA). The conditions of preparation and cross-linking of membranes based on nanocomposite PVA - fullerenol - chitosan were developed. Structural and physico-chemical characteristics of composite membranes were studied by IR spectroscopy, scanning electron microscopy and sorption experiments. The transport properties of membranes were investigated for separation of water containing mixtures by pervaporation.

Keywords: pervaporation, mix matrix membrane, composite, fullerenol.

INTRODUCTION

Membrane methods are highly demanded in various industries for the purification, concentration and separation of liquid and gaseous mixtures due to its unique properties. One of the most promising membrane technologies for separation of low-molecular liquid mixtures is pervaporation which can be used for various industrial scales. Pervaporation can be easily used for separation of azeotropic mixtures, mixtures of isomers, close-boiling and thermally unstable substances. The performance characteristics of this method make it attractive for the chemical, petrochemical, biochemical, pharmaceutical industry as an alternative process of modern methods.

The rapid development of membrane technology, in particular pervaporation, requires the creation of new materials with improved characteristics. Among the variety of membrane materials, the polymers take an important place as they have good mechanical characteristics, film forming properties and selectivity. However, the disadvantage of the majority of known and commonly used polymers, including well-known polyvinyl alcohol (PVA), is low permeability.

RESULTS AND CONCLUSIONS

One of the most promising ways of changes in physico-chemical (structural, mechanical) and transport characteristics of the membrane material is a modification of polymers by known carbon nanoparticles, and blending by another polymer (for example, by chitosan). In the

present work a low-hydroxylated fullerene has been used as a modifier and a cross-linking agent for polyvinyl alcohol.

It has been shown that the addition of fullerenol $C_{60}(OH)_{12}$ and definite amount of chitosan into PVA matrix leads to the significant change of physico-chemical and transport properties due to the changes in structure and morphology.

ACKNOWLEDGMENTS

This work was supported by Fellowship of President of Russian Federation СП-1153.2015.1 (Penkova A.V.). The experimental work was facilitated by equipment from Resource Centers: Research Centre for Nanotechnology, Research Centre for X-ray Diffraction, Research Centre for Physical Methods Surface Investigation, Thermal Analysis and Calorimetry, Chemical Analysis and Materials Research Centre and GEOMODEL at St. Petersburg State University.