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BOOK OF ABSTRACTS

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STRUCTURE AND SEPARATION PERFORMANCE OF NOVEL MIXED MATRIX MEMBRANES CONTAINING IONIC LIQUID AND STAR MACROMOLECULES

Dubovenko R.R.[1], Rostovtseva V.A.[1], Vinogradova L.V.[2], Polotskaya G.A.[1,2], Pulalina A.Yu.[1]

[1]Saint Petersburg State University, Saint Petersburg, Russia
[2] Institute of Macromolecular Compounds RAS, Saint Petersburg, Russia
Student
st062444@student.spbu.ru

Nowadays development of novel environmentally friendly and cost-effective technologies is the main direction of modern industry. Membrane processes are one of the most perspective technologies due to their low energy consumption, high performance, compact equipment, and the possibility of a continuous and automatic process. Particular attention is paid to pervaporation (or evaporation through the membrane) which is widely used for the purification, concentration and fractionation of liquids including azeotropic, close boiling-point and thermally unstable mixtures, since it does not require high temperatures or additional reagents.

Polymers are promising membrane materials due to their low cost, mechanical and thermal stability. Various methods are used for increasing and improving transport properties of polymer membranes. One of most perspective methods is production of mixed matrix membrane combining advantages of materials with different nature. Application of ionic liquids (IL) as polymer modifiers have shown their positive effect on the permeability and selectivity of the membrane process. However, a significant problem is the leaching of ILs from the polymer matrix, which makes it necessary to improve methods of IL immobilization.

Thus, a new complex membrane modifier based on hybrid star-shaped macromolecule (HSM) and [BMIM] [Tf_2N] (1:1) ionic liquid has been proposed (**Figure 1**). Glassy poly(2,6-dimethyl-1,4-phenylene oxide) (PPO) was selected as the polymer matrix due to its low cost and high mechanical strength. A hybrid star-shaped macromolecule consists of a small core C_{60}, 6 arms of nonpolar polystyrene (PS), and 6 polar copolymer of poly(2-vinylpyridine-block-poly-tret-butylmetacrylate) (P2VP-block-PTBMA).

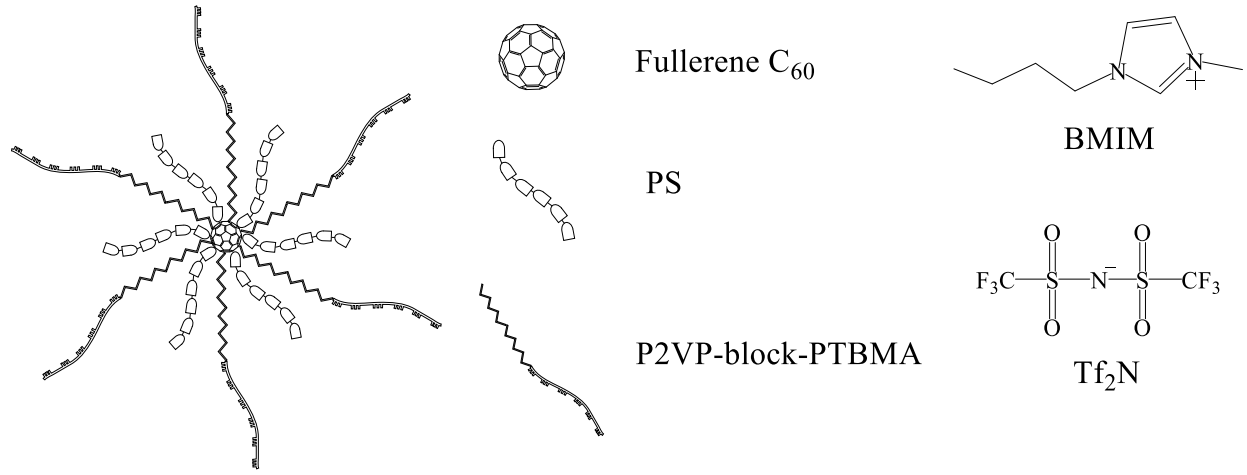

Figure 1. Modifiers: HSM and IL.

The effect of modifiers on the structure and physicochemical properties of membranes was studied using scanning electron microscopy, X-ray diffraction, differential scanning calorimetry and thermogravimetric analysis. The transport properties of the membranes were estimated based on the data of sorption experiments. The overall separation performances for water – lactic acid mixtures are investigated systematically. The task of lactic acid dehydration is related to industrial challenges such as wide application of acid in the food industry, production of biodegradable polymers, as well as biocompatible polymers for medical purposes. It was found that hybrid membrane was essentially permeable and selective to water (water content in permeate is up to 99.8%). It was established that ionic liquids in combination with star macromolecules could be a promising approach as membrane modifiers to achieve higher transport properties.

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