

Nanocomposites and nanomaterials

Organic-inorganic membranes for electro dialytic desalination of glycerine containing impurities of biogenic origin

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Organic-inorganic separators can be used for baromembrane [1] and electromembrane [2] processes for recycling of wastes of food industry. Composite membranes were obtained by modification of heterogeneous polymer cation and anion exchange membranes with nanoparticles of zirconium hydrophosphate and hydrated zirconium dioxide respectively. In order to obtain mainly non-aggregated inorganic nanoparticles (for improvement of ion transport) and their small aggregates (for fouling protection), the synthesis method was approved preliminarily for ion exchange resins, which are used for preparation of the polymer membranes. The modification technique involved simultaneous reorganization of the polymer matrix and precipitation of the modifier. The ion-exchange materials were investigated with methods of electron microscopy, potentiometry, voltammetry, impedance spectroscopy. No influence of zirconium hydrophosphate on charge selectivity of the cation exchange membrane was found. Amphoteric zirconium dioxide slightly decreases transport number of counter-ions through the anion exchange membrane. Aggregation of the nanoparticles affected by glycerine treatment has been established. It was shown, that the aggregates are barriers against additionally sorbed electrolytes and organic substances. The membranes were applied to NaCl removal from highly-concentrated glycerine-water mixture, which is the waste of leather industry. The removal degree of the electrolyte reaches 90 %, the energy efficiency is 1 kWh per 1 dm³ of the mixture. This desalination level allows us to utilize the wastes by means of burning.

1. *Dzyazko Yu. S. , Rozhdestvenskaya L.M., Zmievskii Yu. G. , Vilenskii A.I., Myronchuk V.G., Kornienko L.V., Vasilyuk S.L., Tsyba N.N.* Organic-inorganic materials containing nanoparticles of zirconium hydrophosphate for baromembrane separation // *Nanoscale Research Letters*.-2015.-10. P. 64.

2. *Dzyazko*

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<http://www.sciencedirect.com/science/article/pii/S2214785315007208> - [cor0005 mailto:dzyazko@ionc.kiev.ua](mailto:dzyazko@ionc.kiev.ua) *Rozhdestveskaya L., Zmievskii Yu., Volfkovich Yu., Sosenkin V., Nikolskaya N., Vasilyuk S., Myronchuk V., Belyakov V.* Heterogeneous membranes modified with

nanoparticles of inorganic ion-exchangers for whey demineralization
//Materials Today: Proceedings.-2015.-2, N 6.-P. 3864–3873.