

Nanocomposites and nanomaterials

Composite materials for baromembrane treatment of grain distillery

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Organic-inorganic separators are effective for baromembrane separation of liquid wastes produced by food industry [1]. This work is devoted to transformation of microfiltration membrane to ultrafiltration separators by means of modification with nanoparticles of zirconium hydrophosphate or hydrated zirconium dioxide. The composites were investigated with methods of porometry and scanning electron microscopy.

The particles form aggregates inside active layer and provide rejection of colloidal components on the one hand and stability of the membranes against fouling with organics on the other hand. The ability to reject colloids is caused by secondary porosity, namely by pores between the modifier particles, a size of these pores is up to 100 nm. In fact, the aggregates block pores of the polymer matrix isolating wide cavities, which provide low hydrodynamic resistance. These results were confirmed by indirect methods like measurements of membrane potential and electrical conductivity in a wide range of electrolyte concentration using impedance spectroscopy followed by calculations according to original algorithm. Stability against fouling of the membranes is due to hydrophilic properties of the modifier. The membranes were tested for separation of protein components from corn distillery. In this case, precipitation of insoluble components of the liquid occurs not in pores, but on the outer surface of the membranes and can be removed easy. In opposite to the composite, the pristine membrane accumulates the precipitate inside pores, aggressive chemical reagents are needed for regeneration.

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.