**INFLUENCE OF CELLULOSE MEMBRANE MODIFICATIONS FOR FILTERING PROPERTIES**

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 ***Abstract.*** *The usage of membrane processes for polluted water purification requires research new eco-friendly and cheap materials for membranes production. Cellulose material can be available and alternative raw material for this aim, but it should be noted that before usage it should be improved it filtering properties. In order to it is proposed to modify cellulose membranes with bentonite, microcrystalline cellulose, polyvinyl alcohol, mylar fibers, triethylamine, epichlorohydrin, corn starch to achieve the goal of filtration parameters improvement.*

 Membrane process is the most common technology for water purification nowadays, but it requires innovative solutions for preservation environmental standards, in particular membrane production technology. The membrane technology has great economic potential because it is accessible and has possibility to carry out the process of purification in environmentally friendly way comparing with other methods of cleaning polluted waters [1]. There are known methods of obtaining membranes based on synthetic materials that perform function of cleaning polluted water but they increase the burden on the cleaning ecosystem.

The increases usage of synthetic materials in combination with other factors such as active industrialization, urbanization, non-compliance with international standards for waste management and deforestation can have irreparable impact on the environment which can lead to full ecosystem destruction [2]. Usage of ecological raw materials for membranes production in order to replace synthetic ones does not fully solve the announced problem but it can reduce the burden on the environment.

 As well known ecological material, cellulose has great attention of scientists for purpose to use it in membrane processes. It has number of advantages like high biocompatibility and several functional groups, which allows usage of cellulose material for purification various types of pollutants such as metal ions, organic substances, microorganisms. Cellulose functional groups are easily modified by using various chemicals which allows to expand the spectrum of its usage [3-7].

 Sulfate cellulose is good base material for usage in membrane technologies which have high mechanical characteristics: breaking length at least 8500 m and compressive strength at least 440 kPa. It were investigated filtering properties of laboratory samples of XB-5 sulfate cellulose with a degree of fineness of 90 ± 2 °СR, mass weight 80 g/m2 without no additives and with addition of various auxiliary substances to paper mass like bentonite, microcrystalline cellulose, polyvinyl alcohol, mylar fiber, triethylamine, epichlorohydrin, corn starch. All tests were carried out in a baramembrane cell with different pressures from 0.2 to 1 atm.

It was determined that laboratory sulfate cellulose samples without no additives with weigh 80 g/m2 withstand pressure up to 1 atm and cleans polluted water from agglomerates 5-10 microns in size. Sulfate fibers withstand created load in the baramembrane cell due to their elasticity and elastic strength.

 The addition of mylar fibers with consumption 30% of absolute dry fibers mass and 15% polyvinyl alcohol to the paper mass do not improve the mechanical characteristics of the samples. Synthetic fibers do not have active functional groups and consumption of polyvinyl alcohol is not sufficient for additional bonds formation. Polyvinyl alcohol polar groups primarily interact with hydroxyl groups witch sulfate fibers have.

 A study connected with usage of corn starch which primary modified with aminating solution to improve filtering characteristics in laboratory samples of cellulose membranes was conducted. Epichlorohydrin with triethylamine in a molar ratio 1:1 was used as aminating reagent. It was established that it is necessary to increase the consumption of aminating glues in relation to absolute dry fibers to improve intermolecular bonds in cellulose components with amino groups of modified starch.

Bentonite addition to cellulose sulfate membrane with polyvinyl alcohol with consumption 10% by weight of absolute dry fibers show deterioration of samples mechanical characteristics due to no interaction between bentonite and cellulose fibers. Therefore, it is necessary to carry out the stage of its acid treatment before adding it to the fibrous mass to activate the reactivity of bentonite.

 The microcrystalline cellulose addition into paper mass with sulfate cellulose with it consumption 10% of the absolute dry fibers weight does not improve membrane filtering properties and does not contribute it strength improving. The membrane witch made in such way cannot withstand a pressure of 0.2 atm.

The studies of sulfate cellulose modification technology have shown that for effective considered chemicals usage it is necessary to increase their reactivity due to their additional modification for more effective interaction of cellulose functional groups with modifying components.

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