World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:12, No:05, 2018

Effect of Proteoliposome Concentration on Salt Rejection Rate of Polysulfone Membrane Prepared by Incorporation of Escherichia coli and Halomonas elongata Aquaporins

Authors : Aysenur Ozturk, Aysen Yildiz, Hilal Yilmaz, Pinar Ergenekon, Melek Ozkan

Abstract : Water scarcity is one of the most important environmental problems of the World today. Desalination process is regarded as a promising solution to solve drinking water problem of the countries facing with water shortages. Reverse osmosis membranes are widely used for desalination processes. Nano structured biomimetic membrane production is one of the most challenging research subject for improving water filtration efficiency of the membranes and for reducing the cost of desalination processes. There are several researches in the literature on the development of novel biomimetic nanofiltration membranes by incorporation of aquaporin Z molecules. Aquaporins are cell membrane proteins that allow the passage of water molecules and reject all other dissolved solutes. They are present in cell membranes of most of the living organisms and provide high water passage capacity. In this study, GST (Glutathione S-transferas) tagged E. coli aquaporinZ and H. elongate aquaporin proteins, which were previously cloned and characterized, were purified from E. coli BL21 cells and used for fabrication of modified Polysulphone Membrane (PS). Aquaporins were incorporated on the surface of the membrane by using 1,2-dioleoyl-sn-glycero-3-phosphocholine (DOPC) phospolipids as carrier liposomes. Aquaporin containing proteoliposomes were immobilized on the surface of the membrane with m-phenylene-diamine (MPD) and trimesoyl chloride (TMC) rejection layer. Water flux, salt rejection and glucose rejection performances of the thin film composite membranes were tested by using Dead-End Reactor Cell. In this study, effect of proteoliposome concentration, and filtration pressure on water flux and salt rejection rate of membranes were investigated. Type of aquaporin used for membrane fabrication, flux and pressure applied for filtration were found to be important parameters affecting rejection rates. Results suggested that optimization of concentration of aquaporin carriers (proteoliposomes) on the membrane surface is necessary for fabrication of effective composite membranes used for different purposes.

Keywords : aquaporins, biomimmetic membranes, desalination, water treatment
Conference Title : ICESB 2018 : International Conference on Environmental Systems and Biotechnology
Conference Location : Amsterdam, Netherlands
Conference Dates : May 10-11, 2018