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Functionalization of PET track-etched membrane surface for membrane distillation of saline solution

Membrane Distillation (MD) is one of the membrane separation processes known for more than fifty years and still needs to be improved for its successful application. The main problems of MD are related to high energy consumption, high energetic and economic costs, the lack of membranes and modules for MD that can lead to flawless operation without simultaneous wetting or fouling of the membrane. The efficiency of the MD mostly depends on the type and characteristics of the membrane used, which is well studied in a numerous papers devoted with membranes suitable for MD [1, 2]. For such application, membranes should have high porosity and hydrophobicity, low heat transfer flux and pore tortuosity, large pore size, uniform pore size distribution and optimal thickness, satisfactory thermal and chemical stability (in the case of chemicals separation.

In this work, track-etched membranes (TeMs) were tested in MD process. Astana branch of the Institute of Nuclear Physics has all appropriate technological base to design on a large scale of TeMs with well characteristics. The main disadvantage of TeMs is low porosity (5-30%), along with that TeMs have calibrated pore size and excellent pore size distribution. Their pores are cylindrical shape without any tortuosity. Moreover, TeMs usually have a thickness of 5-24 μm. Characteristics reviewed above make TeMs perspective for MD application, especially for accurate separation or concentration of different liquids. Toward this goal, TeMs based on poly(ethylene terephthalate) (PET) have been chosen as objects of research due to its appropriate chemical, physical, mechanical properties and convenient method of preparation. However, PET is a semi-hydrophobic polymer and for successful application in MD process its modification is required. We will discuss a simple method of photoinduced graft polymerization of silicon compounds on PET TeMs for successful application of such kind of membranes for desalination process.

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