

Growing water scarcity restricts access to fresh water, making desalination one of the most important processes for the future development of life on Earth. Although water desalination can be achieved using membrane processes, the major drawback is the post-treatment of the saline concentrate. The amount of brine produced globally in desalination plants reaches 142 mln m³/day, most of which is discharged to the sea increasing pollution of the environment. Membrane distillation (MD) can effectively treat these brines, but the major problem constitutes the durability of hydrophobic membranes, particularly during the treatment of brines containing various contaminants. Unfortunately, the high salts concentration increased the scaling intensity, which additionally restricted the application of the MD process. Therefore, for this type of the feed, the new composite hydrophilic/hydrophobic membranes or membranes with amphiphobic surfaces are proposed for water desalination by MD. Unfortunately, until now, the possibility of using these new types of membranes was supported by desalination tests carried out generally no longer than 10-50 h, which strongly restricts their implementation in the MD industrial installations.

The aim of the research planed in this project is to obtain the membrane resistance on the wettability/scaling by separated brines, which creates the possibility of implementation these membranes in industrial installations. A perspective results for MD process were obtained when the capillary polypropylene (PP) and Teflon (PTFE) membranes were used. In short-time studies was revealed the resistance of PP and PTFE membranes for brines. In this project, this will be confirmed by long-term MD studies. The research will focus on determining the influence of the modification of polymeric membranes with a metallic layer on their durability, wettability and resistance to scaling during desalination of brines. A membrane morphology and composition of deposits formed on the membrane surface will be analysed by the scanning electron microscope (SEM-EDS), LSM and AFM microscope and by ATR-FTIR apparatus. The composition of solutions will be analysed using IC chromatographs and ICP-AES spectrophotometer. The results of performed studies will be published in the international journals with high impact factor. The participation in both the national and international scientific conferences for presentation of research results will be also included.