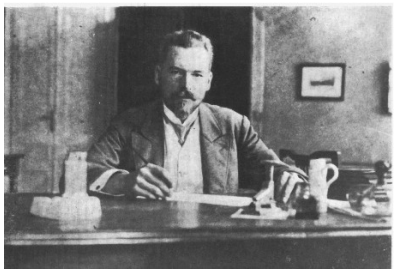

Contribution ID: **34** Type: **poster**

The study of structure influence on diffusion across alginate membranes filled with magnetite

Thursday, 3 December 2020 18:16 (1 minute)

The combination of polymer and inorganic substance in hybrid membrane results in favourable selectivity and permeability, and consequently such membrane becomes a promising alternative to conventional membrane materials. The resulting membranes show improved chemical, mechanical, and thermal stability and hydrophilic–hydrophobic balance. The objective of this research is to determine whether there is a relation between membrane morphology, which is characterized by different parameters, and the diffusive transport in the membrane. We expect that different amount of magnetite particles in alginate matrix cross-linked by different agents influence on structure and morphology properties and also affects the diffusion and transport properties. In this work, we investigate the morphology of cross-sections of the hybrid alginate membranes filled with various amount of magnetite (Fe_3O_4) and crosslinked using four different agents: calcium chloride, phosphoric acid, glutaraldehyde and citric acid. A key aspect of showing structure - diffusion relationship can be the study of the simulation of particle motion in a membrane environment, and in our case, it is a simulation of a random walk on the structures of hybrid alginate membranes. For a better understanding of the problem, we model structures of two–dimensional heterogenic membranes which resemble real structures and then simulate random walk on them. The prototype structures of hybrid polymeric membranes are created with the desired quantity, size and distribution of obstacles, which corresponds to the given amount of magnetite in the hybrid alginate membrane. Generated membranes possessing specific parameters are comparable to the real hybrid alginate membranes filled with magnetite and give a real chance to find the relation between diffusion and structure properties. This observation may support a better understanding of structure influence on mass transport through polymer materials.

[1] G. Dudek, M. Krasowska, R. Turczyn, M. Gnus, A. Strzelewicz, Structure, morphology and separation efficiency of hybrid Alg/Fe_3O_4 membranes in pervaporative dehydration of ethanol, Separation and Purification Technology 182 (2017) 101–109
[2] M. Krasowska, A. Strzelewicz, G. Dudek, M. Cieśla, Structure-diffusion relationship of polymer membranes with different texture, Physical Review E 95, 012155 (2017)
[3] A. Strzelewicz, M. Krasowska, G. Dudek, M. Cieśla, Design of polymer membrane morphology with prescribed structure and diffusion properties, Chemical Physics, 531, 110662 (2020)

Primary authors: STRZELEWICZ, Anna (Silesian University of Technology); KRASOWSKA, Monika (Silesian University of Technology); DUDEK, Gabriela (Silesian University of Technology); CIESLA, Michal (Institute of Theoretical Physics, Jagiellonian University, Kraków, Poland)

Presenter: STRZELEWICZ, Anna (Silesian University of Technology)

Session Classification: Poster Session