DEVELOPMENT OF AN ELECTROCHEMICAL REACTOR FOR THE FABRICATION OF NANOPOROUS AAO MEMBRANES

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This article is intended for the research and development of innovative functional nanoporous membranes manufacturing technology. To produce better quality nanoporous membranes with controlled pore areas, a novel electrochemical reactor was designed. The reactor is composed of corps of the reactor, cover of the reactor, aluminum sheet, mixing device, Peltier element, gasket, M3 nuts, and M3x50 screws. 3D model of the electrochemical reactor for the fabrication of nanoporous AAO membranes is presented in Figure 1. In order to maintain a low and uniform temperature inside the reactor during the anodization process, a mixing device and Peltier element were installed. Mixing simulations were developed and performed in the new reactor by using ANSYS 17 software. Theoretical mixing results compared to experimental ones. Furthermore, experiments on temperature changes inside the reactor were also performed. The result of the temperature changes experiment is shown in Figure 2.

Fig. 1. 3D model of the electrochemical reactor for the fabrication of nanoporous AAO membranes: 1) cover of the reactor; 2) aluminum sheet; 3) screw M3x50; 4) mixing device; 5) corps of the reactor; 6) Peltier element; 7) nut M3.

Fig. 2. Temperature changes inside the reactor.

The results of the mixing and temperature analysis confirmed that the design of the electrochemical reactor met the requirements that are important during the two-step anodization process. The observed results will be useful in the further development of the electrochemical reactor that is designed for the fabrication of nanoporous AAO membranes.