**MOF-modified membrane for the extraction of lithium from oilfield brines**

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**Introduction.** Lithium, which is claimed to be the «Energy Metal in the 21st Century» [1], is in high demand due to the rising use of electric vehicles and high-tech electronics powered by lithium-ion batteries. With global demand increasing rapidly, concerns about potential scarcity are growing. To mitigate this issue, newly-introduced solutions are essential. Innovative direct lithium extraction technologies offer significant potential to expand lithium supplies, particularly from water sources, including lithium-rich wastewater from oil and gas condensate operations.

**Body part of the report summary.** Using a composite membrane as an extractor module is a beneficial method for achieving high-purity lithium from wastewaters’ concentrate. The proposed membrane is based on polyamide substrate (PA) that has been modified multiple times with a metal-organic framework zeolitic imidazolate framework-8 (ZIF-8). PA is an economical supporting material that maintains strong stability during the metal-extraction process. ZIF-8 was chosen for ion-selective separation because of its consistent porosity, appropriate size attributes, and large surface area, which make this framework especially effective for lithium recovery processes [3].

A hydrothermal modification was used to introduce ZIF-8 onto the membrane surface. This modification process was performed multiple times to ensure a uniform ZIF-8 layer across the entire membrane, as it is crucial towards achieving the desired selectivity. Figure 1 represents the scheme of the synthesis.



Fig. 1. The membrane modification process

After analyzing the surface with the help of Fourier transform infrared spectroscopy, Scanning electron microscopy, and Energy-dispersive X-ray spectroscopy we confirmed the successful synthesis and revealed the presence of ZIF-8 layer on the surface of membranes. The consequent stage of the research included the identification of the most promising number of ZIF-8 layers onto the membrane by the means of chronoamperometry and linear sweep voltammetry tests in a model of an electrochemical cell. These tests are crucial in order to identify a membrane with the most uniform and intact metal-organic framework coating.

**Conclusions.** A thorough evaluation of lithium extraction techniques was performed, and the results of this evaluation led towards choosing the ion-selective membrane as the most promising technology for extracting lithium from oilfield waters. Subsequently, the most viable practical modifications of the membrane were synthesized and studied.

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**References**

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