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Comparison of the efficiency of micro-pollutant removal from geothermal water on a laboratory and a semi-industrial scale

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ABSTRACT

In recent years, there has been an increase in the demand for drinking water and also for water intended for agriculture, industry, and other purposes. Therefore, research is needed to find new technologies and methods for the comprehensive use of geothermal waters (GTs) to provide drinking water and water that can be used for other purposes in an environmentally-friendly way. The maximum permissible concentrations of inorganic micropollutants, including toxic constituents, both in drinking water and in wastewater discharged into the environment, are set by the World Health Organization, the Water Framework Directive, and relevant national regulations. The paper presents a comparison of the effectiveness of the removal of selected inorganic components from GTs on a laboratory and semi-technical scale. GT with mineralization of about 6 g/L was used in the research. Laboratory and semi-industrial tests were carried out with the use of NF270, NF90, ROBW30FR-400, and ROBW30HR-440i membranes from DOW FILMTEC Company. The research work carried out proved that the treatment of mineralized and salt-laden GT with increased content of micro-contaminants, including heavy metals, using a two-stage Nanofiltration-Reverse Osmosis system is an effective solution. Tests conducted on a laboratory (and semi-industrial) scale permitted micro-pollutant removal up to following values: B 96% (26%), Cr^{3+} 86% (55%), Pb^{2+} 94% (75%), Ni^{2+} 67% (50%), Fe^{2+} 99% (92%), and As^{3+} 93% (67%). The use of membrane processes in water treatment can provide more or less selective removal of the target micropollutants.

Keywords: Micropollutants; Membrane processes; Geothermal water; Boron; Arsenic

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