ANNOTATION

dissertation work of Itemen Nurbol Mergenbayuly on the topic: "Assessment of the development of associated reservoir brines in the oil and gas fields of Southern Mangyshlak and the development of a technological scheme for extracting lithium and its compounds from them," submitted for the degree of Doctor of Philosophy PhD in specialty 6D075500 – "Hydrogeology and engineering geology"

The relevance of research. The relevance of research. Groundwater is of greatest importance for the socio-economic development of Kazakhstan. Recently, given the depletion of mineral deposits, more and more attention has been paid to industrial waters. Industrial waters include groundwater and brines containing useful components or their compounds in quantities that ensure, within specific hydrogeological regions (or their individual parts), cost-effective extraction and processing of these waters in order to obtain useful products using existing technical means and using modern technological processes.

The feasibility and economic efficiency of processing hydromineral raw materials is confirmed by the continuous production of lithium in many countries. According to expert estimates, 78% of the world's lithium reserves, 42% of rubidium, and 36% of cesium are currently concentrated in natural waters.

The world's main reserves of lithium raw materials are confined to the "lithium triangle" in Latin America, covering three countries at once - Argentina, Bolivia and Chile. It is here that up to 70% of global lithium reserves are concentrated. At the same time, two thirds of them were found in Bolivia, in the southwest of which the world's largest dry salt lake, Salar de Uyuni, is located, where under a solid salt crust there is a liquid brine with a high concentration of lithium.

In the USA, lake brine is used. Searles Lake (California), in which lithium chloride is found together with sodium, potassium and boron salts. As a result of brine processing, lithium is extracted along with the extraction of potash, borax and other salts.

In the CIS, iodine was extracted from natural waters at the following plants: Baku Iodine Plant, Novo-Neftechala Iodine-Bromine Plant (Azerbaijan), Cheleken Chemical Plant, Nebid-Dag Iodine Plant (Turkmenistan), Troitsky Iodine Plant and Ural Production Association "Halogen" (Russia).

The following standard content of industrial components in natural waters is accepted (mg/l): lithium not less than 10, rubidium ≥ 3, cesium ≥0.5, strontium ≥300, bromine ≥200, iodine ≥10, boron ≥50, potassium ≥500 , germanium ≥0.05. When assessing the feasibility of using industrial waters, in addition to the concentrations of elements, water reserves and conditions of future operation (depth and flow rate of wells, depth of the dynamic level, temperature and gas composition of water) are of significant importance.

President of Kazakhstan Kassym-Jomart Tokayev in October 2022, during a meeting with the public of the Zhetysu region, announced the need for serious

investments in the exploration and development of lithium and instructed the Geological Service to intensify work in this direction.

Thus, the study of the problems of developing associated reservoir brines in the oil and gas fields of Southern Mangyshlak and the development of a technological scheme for extracting lithium and its compounds from them seem to be very relevant.

The object of research is industrial groundwater in the territory of Southern Mangyshlak.

The purpose of the work is to study modern hydrogeological and hydrogeochemical conditions and features of the formation of brines in the oil and gas fields of Southern Mangyshlak, to develop a technological scheme for extracting lithium and its compounds from them; assessment of their operational reserves and forecast resources.

To achieve this goal, the following tasks were solved:

- study of geological, hydrogeological and hydrochemical conditions of the territory to clarify the main patterns of formation and assessment of forecast resources and reserves of underground industrial brines;
- carrying out hydrogeochemical analysis and substantiation of methods for the distribution of valuable components in underground industrial brines for the purpose of their further processing;
- justification of methods for physical and chemical modeling of the “water-rock” system for the extraction of lithium and its compounds from industrial brines;
- development of a technological scheme for the extraction of lithium and its compounds from reservoir brines with an assessment of its effectiveness;
- assessment of forecast resources and operational reserves of underground industrial brines.

Research methods. The research methods used in the work include: field hydrogeological, hydrochemical, paleohydrogeochemical, chemical-analytical methods using atomic emission spectrometry with inductively coupled plasma ICPE-9820, based on the use of modern spectrometers and isotope analysis, as well as methods of physical and chemical modeling of the “water” system -breed".

Scientific novelty. Based on the results of a complex of scientific research:

- the distribution patterns, qualitative and quantitative characteristics of formation brines of groundwater in Southern Mangyshlak in the Asar, Bekturly, Southern Zhetybai fields have been clarified;
- by methods of physico-chemical modeling using the Selector software package, built on the basis of thermodynamic data, the possibility of extracting lithium and its compounds from brines at these deposits was confirmed;
- based on the research and calculations carried out using modeling methods, a technological scheme for the extraction of lithium and e compounds was proposed (refined)