

SOME TECHNOLOGICAL ASPECTS OF COMPRESSED HELIUM STORAGE IN SALT CAVERNS

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Abstract

The paper describes the findings of the research of physico-chemical processes of gaseous helium-rock salt-brine interaction subject to helium storage in underground reservoirs built in rock salt deposits.

Comparative experimental studies of rock salt and backfill helium permeability were conducted in OOO "Podzemgazprom", studies of helium diffusion in rock salt – in Lomonosov Moscow State University and helium solubility and diffusion in NaCl solutions – in the Institute of solution chemistry, Russian Academy of Sciences.

Experiments were conducted to determine the absolute permeability of rock salt samples for helium and nitrogen. The experiments on salt deformed samples were performed after the experiments on salt undisturbed samples. Similar experiments were performed for oil-well cement samples.

Understanding of brine grain interlayers as the elements of structure formation, which are typical for all areas of brine contact without exception was evolved from the base of salt layers study. These layers represent the most effective route of the helium diffusion expansion in undisturbed rock salt mass. The estimation of helium migration rate on water layer in undisturbed salt deposit was analyzed.

Statistical processing of the published data on helium solubility in water and brine has been provided. Experimental measurement of helium solubility in water and brine has been performed in order to verify the reliability of gained samples.

Computer simulation has been performed. The tables of recommended data on helium diffusion in water and brine at a wide range of brine concentrations, temperature and pressure were compiled.