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BENTONITE CLAYS AS MATERIALS FOR ENGINEERED BARRIERS

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Bentonite is one of the most important raw materials. It has a wide area of application. For environmental protection the clay is generally used as sorbent and sealing component. The use of bentonite buffer as engineering barrier is provided for modern projects of deep radioactive waste storage. Insulating properties of bentonite are due to a low permeability, the ability to swell, plasticity, a high sorption capacity and a high content of montmorillonite (> 60%). Because of the saturation of bentonite by underground water it swells and seals cracks in the rocks.

Experimental studies indicate that natural clays are effective sorbents of some radionuclides from solutions, often radioactive cesium and strontium. Sorption of the radionuclides occurs due to exchange cations of sodium, magnesium, calcium and others.

Traditional mineral barriers selected because of their natural coarseness and high natural durability may crack due to subsidence or drying. To avoid this bentonite is modified by polymers. Thus, in the Netherlands is created material based on bentonite and polyacrylamide called trisoplast [1]. It is obtained by mixing bentonite-polymer component with mineral filler, such as sand. When combined with water, trizoplast forms a strong, dense cobweb gel structure as a result of chemical bonds between the particles of clay, sand and polymer. This leads to a significant improvement of the barrier properties because sand provides trisoplast with mechanical strength, bentonite polymer gel - the necessary flexibility and hydraulic characteristics.

For experiments the bentonite clay from Cherkassy deposits (Ukraine). The mineral composition of the clay is presented mainly montmorillonite (70-95%) and impurities of fine calcite and quartz. To modify it anionic and cationic polyacrylamides (PAA) production "HENGFLOK" (China) were used.

The bentonite was activated by sodium bicarbonate. Then to bentonite gel was added polyacrylamide solution. The mixture was stirred and maintained for 24 hours and then dried at 40°C.

Sorption of cesium was studied at the ratio of bentonite to a solution as 1:100. Activity of the solution was 5 Bq / ml.

Sorption of Strontium from the solution with activity of 6.5 Bq / ml and the ratio of bentonite to the solution as 1: 100 was researched.

It was found sorption that the bentonite modified by anionic PAA significantly better absorb radionuclides ^{137}Cs than bentonite modified by cationic PAA.

The study showed that at the concentration of polymer up to 1% sorption capacity of modified bentonite in relation to ^{90}Sr was high (97.5%) and did not depend either on the molecular weight of the polymer or its degree of hydrolysis.

It was established that the swelling of bentonite modified by anionic PAA depends on the concentration, the degree of hydrolysis and molecular weight of the polymer.

Thus, bentonite, modified by polyacrylamide with high absorption properties with respect to ^{137}Cs and ^{90}Sr.

It was found that the modification of bentonite by polymer leads to an increase in swelling. The degree of swelling depends on the concentration, the degree of hydrolysis and molecular weight of the polymer.

It is shown that promising for practical application in the barrier material can be modified bentonite, containing up to 0.5% anionic PAA with a low degree of hydrolysis and low molecular weight.

Джерела:

1. http//www.trisoplast.nl/default.php?pageid=2.