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Mechanical properties of crystalline rock of Ukraine and Sweden for safe geological borehole disposal

Streszczenie

It is internationally accepted that geological disposal is long-lived waste management solution, for which considerable practical experience has been developed. Variant of waste disposal in specially made mine workings is the most extensively studied. Deep emplacement of high level waste and spent nuclear fuel in crystalline basement rocks underlying sedimentary strata is expected to provide effective long-term (> 1 million years) isolation of radionuclides from the biosphere due to the following thermal, hydrologic, chemical, and mechanical characteristics of rock at depths of several kilometers. The layout of the underground openings shall be adapted to the repository rock so that mechanically stable conditions are provided and the containment of radioactive substances can be sustained over a long period of time. It is the SKB's (the Swedish Nuclear Fuel and Waste Management Company) requirement.

The mechanical features includes the in situ stress state and the deformation and strength properties of the intact rock, the fractures, the rock mass between deformation zones and the deformation zones themselves. There is also a need to consider the interaction of the rock mechanics model with the hydrogeological model.

Crystalline rocks are particularly attractive for borehole emplacement because of their large size, relatively homogeneous nature, low permeability and porosity, and high mechanical strength. In addition, high overburden pressures contribute to sealing of some of the fractures that provide transport pathways.

Analysis of petrophysical properties of rocks (granitoids) to select the least permeable rocks objective of the study was the thesis, the main points of which are reflected in scientific works. Also the comparative characteristic of certain geological conditions and some mechanical properties of granitoids Sweden and Ukraine are done.