

Thermo-hydraulic-mechanical analysis of deep geological disposal of high level nuclear waste

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Summary

In deep geological disposal for high-level radioactive waste (HLW), one of the most important factors is to study the thermo-hydraulic-mechanical (THM) behavior of natural barrier that consists of host rock, most made from sedimentary rock or granite. In this paper, based on a new simple thermo-elasto-viscoplastic model of soft rock proposed by Zhang & Zhang (2009), a program of finite element method (FEM) has been developed to simulate the above-mentioned THM behavior of geological disposal. 2D and 3D analyses are conducted to estimate long-term stability of the host rock. The man-made barrier, usually composed of buffer material of bentonite, metal container and glass-mixed nuclear waste, are assumed to be elastic in their mechanical behavior. It is known from the analyses that thermal conductivity plays a very important role in the heat-induced stress-strain field. In some circumstances, long-term instable state of the host rock might occur if the heat generated from the nuclear waste is not properly treated.

