土木工程

热源对核废料处置库近场性状的影响

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Influence of Heat Source on Near Field Behavior of Nuclear Waste Repository

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摘要 采用高放射性核废料处置库模型进行试验, 以核废料处置库近场的膨润土及岩石为研究对象, 建立轴对称模型. 选用适当的控制方程, 运用有限元软件Code-Bright对核废料处置库关闭后处置库近场的温度场、渗流场、应力场进行热-水-力(thermo-hydro-mechanical, THM)耦合的数值模拟. 通过比较不同初始热源, 得到了处置库关闭后近场膨润土及岩石内温度、液体饱和度、吸力及应力的变化规律. 结果表明, 初始热源较小时膨润土和岩石的性质更为稳定.

关键词: 膨润土   Code-Bright   核废料处置库   热-水-力耦合

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Abstract： A model test for high-level radioactive nuclear waste repository is carried out. An axisymmetric model for nuclear waste repository of bentonite and rock in the near-field of the nuclear waste repository is established. Considering the thermo-hydro-mechanical (THM) coupled process, temperature field, seepage field and stress field in the near-field after closure of nuclear waste repository, numerical simulation of fully coupled THM is done by using the finite element method (FEM) software Code-Bright with a proper choice of THM constitutive equation. By comparison of different initial heat sources, temperatures of bentonite and rock, liquid saturation, suction and variation of stress in the near field after closure of repository are obtained. The results show that the lower the quantity of initial heat, the better the properties of bentonite and rock.

Keywords： bentonite,   Code-Bright,   nuclear waste repository,   thermo-hydro-mechanical (THM) coupling

引用本文:

.热源对核废料处置库近场性状的影响[J] 上海大学学报(自然科学版), 2013,V13(5): 520-526

.Influence of Heat Source on Near Field Behavior of Nuclear Waste Repository[J] J.Shanghai University (Natural Science Edition), 2013,V13(5): 520-526

链接本文:

http://www.journal.shu.edu.cn//CN/10.3969/j.issn.1007-2861.2013.05.015   或   http://www.journal.shu.edu.cn//CN/Y2013/V13/I5/520

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