期刊文章

Utilization of Slovak bentonites in deposition of high-level radioactive waste and spent nuclear fuel

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作者

Michal Galambošš[1], Ol’ga Rosskopfová[1], Jana Kufčáková[1], Pavol Rajec[1]

[1]Department of Nuclear Chemistry, Faculty of Natural Sciences, Comenius University in Bratislava, Mlynská Dolina, 842 15 Bratislava, Slovak Republic

摘要

Abstract
The basic strategic aims in the field of managing high-level radioactive waste and liquidation of nuclear power plants are all contained in the Energy policy of the Slovak Republic. Its aim is to resolve the concept of the backside of the nuclear energetics fuel cycle—long-term deposition of high-level radioactive waste and spent nuclear fuel (SNF). The most important form of high-level radioactive waste and SNF long-term deposition is their deposition in deep geological formations created by natural as well as engineering barriers used to isolate the long-lived radionuclides from the biosphere. The basic components of these barriers are clays, of which bentonite is generally referred to as the most suitable clay material. There are a few significant bentonite deposits in the Slovak Republic: *Jelšový potok*, *Kopernica*, *Lastovce*, *Lieskovec*, *Dolná Ves*. The review article summarizes the information on geotechnical properties of Slovak bentonites published up-to-date, which is inevitable to know for the intention of their use. It highlights the advantages and shows drawbacks of five Slovak deposits. It suggests further research direction, to draw a thorough hydraulical, microbial and radiation profile of Slovak bentonites.

Keywords

Slovak bentonites, Jelšový potok, Kopernica, Lastovce, Lieskovec, Dolná Ves, Radioactive waste, Spent nuclear fuel, Deep geological repository

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M. Galamboš (✉) · O. Rosskopfová · J. Kufčáková · P. Rajec
Department of Nuclear Chemistry, Faculty of Natural Sciences, Comenius University in Bratislava, Mlynská Dolina, 842 15 Bratislava, Slovak Republic
e-mail: galambos@fns.uniba.sk

Introduction

The basic strategic aims in the field of managing high-level radioactive (HLRW) waste and liquidation of nuclear power plants are all contained in the Energy policy of the Slovak Republic. Its aim is to resolve the concept of the backside of the nuclear energetics fuel cycle—long-term deposition of HLRW and spent nuclear fuel (SNF).

The review article summarizes the information on geotechnical properties of Slovak bentonites published up-to-date, which is inevitable to know for the intention of their use in deposition of HLRW and SNF. It highlights the advantages and shows drawbacks of five Slovak deposits. It suggests further research direction, to draw a thorough hydraulic, microbial and radiation profile of Slovak bentonites.

The most important form of HLRW and SNF long-term deposition is their deposition in deep geological formations created by natural as well as engineering barriers used to isolate the long-lived radionuclides from the biosphere. The basic components of these barriers are clays, of which bentonite is generally referred to as the most suitable clay material [1–5].

Significant producers of HLRW and SNF in Slovakia are nuclear power plants located in Bohunice and Mochovce [6]. In the Slovak energetics as fuel mainly uranium dioxide is used, enriched by uranium-235 radioisotope, that the average enrichment in the fuel cartridge is 3.82%. One reactor of 1,000 MW power annually produces about 30 t of SNF. Because the fuel has a high density, it represents the volume of only about 1.5 m^3 [7]. One WWPR 440 block annually produces about 220 m^3 of low-level, 90 m^3 of medium-level radioactive waste and 10 t of SNF. It is assumed that blocks of individual nuclear power plants in Slovakia will produce during their project operation period

Akadémiai Kiadó
H-1519 Budapest, Pf. 245
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