EUROPEAN COMMISSION

Community Research

DOPAS

(Contract Number: FP7 - 323273)

Deliverable n° D7.10

D7.10 Experiment poster of EPSP at the underground site with EC acknowledgements in URC Josef Gallery (Czech Republic)

Authors: *Marketa Dvorakova, SURAO*

Date of issue of this report: **26/2/2014**

Start date of project: 01/09/2012 Duration: 48 Months

Project co-funded by the European Commission under the Euratom Research and Training Programme on Nuclear Energy within the Seventh Framework Programme		
Dissemination Level		
PU	Public	x
PP	Restricted to other programme participants (including Commission Services)	
RE	Restricted to a group specified by the partners of the DOPAS project	
CO	Confidential, only for partners of the DOPAS project	

EURATOM

Scope	Deliverable n°7.10	Version:	1.0
Type/No.	Other	Total pages:	4
		Appendices:	0
Title:	D7.10 Experiment poster of EPSP at the underground site with EC acknowledgements in URC Josef Gallery (Czech Republic)	Articles:	

ABSTRACT:

This Deliverable shows the EPSP Experiment poster which has been emplaced in the Josef Underground Laboratory

RESPONSIBLE:
Marketa Dvorakova, SURAO

REVIEW/OTHER COMMENTS:

This Deliverable has been internally approved by CTU and RAWRA.

APPROVED FOR SUBMISSION:
Johanna Hansen 26.2.2014

D7.10 EXPERIMENT POSTER OF EPSP AT THE UNDERGROUND SITE WITH EC ACKNOWLEDGEMENTS IN URC JOSEF GALLERY (CZECH REPUBLIC)

A permament stand for hosting EPSP experiment poster has been emplaced in the Josef Gallery conditions in the EPSP eperiment site. Yearly amount of visitors in Josef Underground Gallery is around 1000 persons.

SÚRAO | RADIOACTIVE WASTE REPOSITORY AUTHORITY

DOPAS - Experimental construction of plug and seals for deep radioactive waste repositories

Markéta Dvořáková, Irena Hanusová and Marek Vencl
Radioactive Waste Repository Authority, Dlážděná 6, Prague 1, 110 00

The international DOPAS (Full-Scale Demonstration of Plug and Seals) project involves research into, and the development of, different types of plugs and sealing materials for use in the construction of radioactive waste repositories. The aim of the project is to describe in detail the hydraulic properties and mechanical behaviour of materials employed in plug construction under deep geological repository conditions. At the same time, the functional and safety requirements of the plug as a whole will be defined.

The project was initiated by the Implementing the Geological Disposal of Radioactive Waste Technology Platform (IGD-TP) and is being subsidised from European RTD project resources. Fourteen organisations (POSIVA, ANDRA, DBE TEC, GRS, NAGRA, NDA, SÚRAO, SKB, CTU, NRG, GSL, BTECH, VTT, ÚJV) from a total of eight European countries are involved in the project, the planned duration of which is four years (09/2012 – 08/2016).

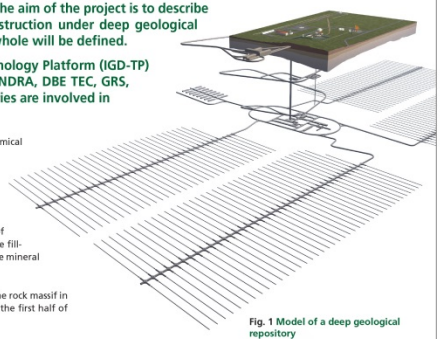


Fig. 1 Model of a deep geological repository

Several different types of plugs are proposed in the Czech Deep Geological Repository concept (fig. 1). Their purpose is to safely and securely seal and close individual parts of the repository during the operational stage of the facility, i.e. up to 150 years. The plug must be constructed so as to be able to resist the high pressure (up to 10MPa) created as a consequence of hydrostatic pressure and volume changes within the engineered barriers of the repository.

The plug construction experiment (EPSP) is being conducted by a 3-member Czech consortium (SÚRAO, CTU, ÚJV) at the Josef Underground Research Centre (located close to the town of Dobříš) in the Čelina – Mokrsko Au-bearing section of the facility. The host rock consists of granitoid of the Sazava type of the Variscan era (Morávek et al., 1992). Niche SP-59 in the Mokrsko-West area was chosen for the construction of the experiment. The host rock is penetrated by quartz and quartz-carbonate veins with a thickness of a maximum of 14cm. The dominant fracture systems are shown in the relevant geology engineering documentation (fig. 2) which was modified according to local Geofond maps – Dobříš 1-9/34-24, M-SCH-Z/SP-59.

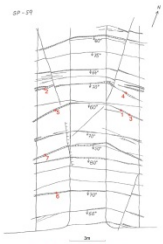


Fig. 2 Geology engineering documentation for niche SP - 59 including sampling positions

The EPSP experiment concept is based primarily on the use of Czech materials and technologies available in the Czech Republic. The construction of the plug (fig. 3) was designed at the Centre of Experimental Geotechnics of the CTU (Czech technical University) in Prague. The first layer of the plug consists of a concrete segment made of low pH cement and the second layer of a mixture of compressed bentonite pellets and crushed ice. The pellets are of Ca/Mg bentonite with the industrial designation B75 (Keramost Ltd.) from the Rokle/Černý Vrch deposit. The plug is sealed with a second concrete layer.

A detailed mineralogical study of fracture fillings in the SP-59 experimental niche was carried out in 2013; the locations of the samples taken are shown on the map in figure 2. Six samples were analysed using the powder X-ray diffraction method at the Institute of Chemical Technology in Prague (X'Pert PRO with Bragg-Brentano geometry, CuKα, 40 kV, 30 mA, High Score Plus) and SEM at the Charles University in Prague.
The diffraction data from individual phases is shown in figures 4 to 9 and surface scan information in figures 10 to 13. Sample number 7 (fig. 2) was collected from a mineralised fracture with a thickness of 8.5 – 14cm in order to determine both the chemistry of the filling and the potential semi-quantitative recalculation of the mineral phases present (tab. 1).

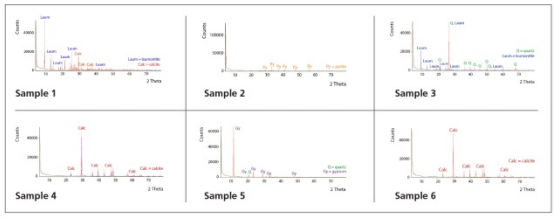
Grouting for the purpose of enhancing the properties of the rock massif in the area of contact with the future plug was planned for the first half of 2013. This will be followed by the construction of the EPSP experimental plug itself which will be completed and put into operation at the beginning of 2014, from which time continuous monitoring will be carried out. The data obtained will subsequently be used for the construction of mathematical models and for safety analysis purposes.

Tab. 1 Silicate analysis of sample 7

Analytical determination GEMATEST, Ltd.

weight loss	<0.1 wt. %
	wt. %
SiO_2	56.12
TiO_2	0.18
Al_2O_3	4.94
Fe_2O_3	0.71
FeO	0.22
MgO	0.08
CaO	19.98
K_2O	0.16
Na_2O	0.76
CO_2	14.08
F	0.14
SO_3^{2-} (tot.)	0.73
SO_3^{2-}	0.09
	mg/kg
Cr	69.5
Ni	<5

Fig. 4-9 XRD analysis of sample



References:
Geofond: Dobříš 1-9/34-24, M-SCH-Z/SP-59.
Morávek, P. et al. (1992): Zlato v Českém masivu (Gold in the Czech massif). ČGÚ, Prague.

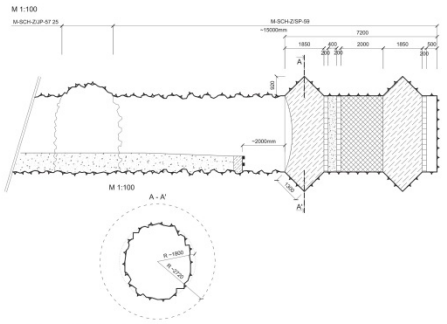


Fig. 3 Scheme of the EPSP plug

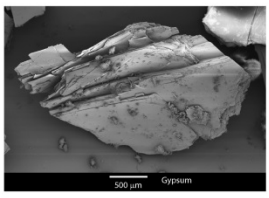


Fig. 10 SEM analysis of gypsum

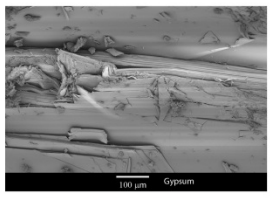


Fig. 11 SEM analysis of the pinnated zone

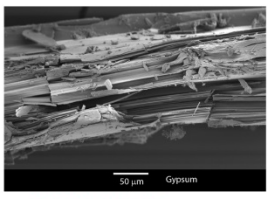


Fig. 12 SEM analysis of gypsum

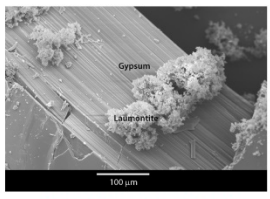


Fig. 13 SEM analysis of gypsum and laumontite

www.surao.cz

The research leading to these results has recieved funding from the European Union's European Atomic Energy Community's (Euratom) Seventh Framework Programme FP7/2007-2011 under grant agreement no 323273, the DOPAS project.

OUR SAFE FUTURE

Picture 1.Picture of EPSP Experiment poster at Josef Gallery (underground laboratory)