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Development of radionuclide tracer tools describing contaminant migration in the geosphere

Milan Zuna (1), David Dobrev (1), Václava Havlová (1), Pavel Kus (2), and Daniela Doubravova (3)

(1) ÚJV Řež, a. s., Fuel Cycle chemistry department, Husinec -Řež, Czech Republic (milan.zuna@ujv.cz), (2) Research Centre Rez, Husinec -Řež, Czech Republic, (3) Advacam s.r.o, Praha, Czech republic

Descriptions of processes that affect contaminants, such as heavy metals, radionuclides or nanomaterials in the geosphere are often hindered due to sampling difficulties, complicated analytical procedures, or due to lack of knowledge of process boundary conditions. Even in the case of laboratory tests, it appears that on-line measurements of the contaminant transport, especially non-radioactive, are crucial for any migration experiments. Presented project envisages to develop use of radioactive tracers as a tool to track the migration of tracers in rock fractured environment, including laboratory tests.

The use of radionuclide tracers generally exploits following advantages

• excellent detection
• low detection limits
• possibility to study tracer space distribution in the rock

In the past, long-term radioisotopes (e.g., 3H, 133Ba, 134Cs, etc.) were used for migration test on crystalline rock samples. However, it should be remembered that using long lived radionuclide tracers on the rock samples (especially the medium scale ones) would cause “almost permanent” contamination. Therefore those samples cannot be reuse. In addition, radioactive waste is generated in large volumes that need to be managed according to the legislation.

In case of use of short-term tracers both in laboratory experiments and real rock environment during tracer tests, would allow to replicate the experiments on the same sample set up, altogether with effective optimalisation of radioactive waste production. The developed measurement system enables on-line monitoring and 3D visualization of the activity distribution in the samples.

The paper will show the first steps in development of tracer production and short-lived radionuclide detection techniques in rock samples.