SUMMARY

Cementitious materials will serve as a construction and filler material for the construction of a deep repository of radioactive waste. Therefore, three different materials represented by four samples were studied in the present work. This is CEM II AS 42,5R cement commercially available in Čížkovice, cement CEM III B / 32,5 SV with ash and aggregate used as filler concrete for storage chambers from radioactive waste repository Richard and cement CEM I 42, 5 with fine and coarser aggregate used for fixed radioactive waste (RAW) in Velké Zbytky in the area of ÚJV Řež, as

Chemical (silicate analysis) and phase composition (XRD powder diffraction analysis) were determined in the studied materials. Further, the orientation strength of the monolithic samples and their mutual comparison (compression strength measurement) were determined.

Percolation leaching experiments were carried out, three columns with CEMII, RICHARD and ÚJV samples were run. The conditions of the experiments were chosen to approach the conditions in the rock environment of a possible deep radioactive waste repository. Synthetic granite water (SGW) was used as the leaching solution.

In all column experiments, attempts to observe changes in the concentrations of selected indicators (Na^+, K^+, OH^-, Ca^{2+}, pH, Conductivity, SiO_2, Mg^{2+} and Sr^{2+}) were characteristic of the development of cement water.

The results of the leaching experiments showed a similar trend in the leachate composition, when alkali metal sulphates (Aft, AFm) are first dissolved, which corresponds to high concentrations of Na^+, K^+, OH^- in the beginning and to a lesser extent Ca^{2+}. Alkaline depletion and pH lowering will result in the $Ca(OH)_2$ portland dissolution and an increase in Ca^{2+} concentrations. This is followed by dissolution of the CSH phase, first incongruent (especially Ca^{2+}) then congruent (Si begins to appear in the solution). At the last stage, the leachate composition is already dependent on the incoming solution and residual aggregate. Direct comparison of the results with earlier experiments is not feasible due to the large number of variably adjustable parameters for individual experiments.

Keywords: cement, concrete, deep radioactive waste repository, column leaching experiment