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► **To cite this version:**

Matthieu de Campos, Charles Reeb, Adrien Gerenton, C.A. Davy, David Lambertin. Durability of alcali-activated materials in case groundwater intake. NUWCEM 2022 - 4th International Symposium on Cement-Based Materials for Nuclear Wastes, May 2022, Avignon, France. cea-04718355

**HAL Id: cea-04718355**

**<https://cea.hal.science/cea-04718355v1>**

Submitted on 7 Jan 2025

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## DURABILITY OF ALCALI-ACTIVATED MATERIALS IN CASE GROUNDWATER INTAKE

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**KEYWORDS:** *Pore structure, Mechanical properties, Geopolymer, Blast furnace slags*

### Abstract

In the context of nuclear waste management, wastes are stored in repositories to allow environmental and human protection. To achieve these requirements, the waste is treated, a possible way is cementation. Cementitious matrices have been used as a blocking material to prevent radionuclide release to the environment. One of the problems of this type of disposal is the development of aqueous leaching conditions. These leaching conditions are created when rain, snow or groundwater penetrates the concrete mass and comes into contact with the waste. In the worst case, depending on the physico-chemical nature of the groundwater, there may be a release of radio-elements into the environment. This release is dependent on the ability of penetration of the water into the material, which is controlled by the porosity of the material.

Our study focuses on the durability of alkali-activated materials when subjected to water leaching. For this purpose, various materials were investigated: sodium (Na)-geopolymers, potassium (K)-geopolymers and an activated blast furnace slags. These materials are used to be in direct contact with specific wastes (due to their physico-chemical compatibility). In case of a deep repository, they are placed in structures made of Portland cement (host matrices); therefore the leaching solutions will then become enriched with the chemical elements of the host matrix. In our study, various waters and conditions were considered, such as typical CEM V cement water, lime water, carbonated water, and endogenous conditions (cured in airtight bags). The porosity of the materials was studied by thermoporosimetry, BET and mercury porosimetry, up to 180 days of contact with the solutions. X-ray diffraction phase analysis and mechanical characterization were also performed.

The analysis of the results will enable a first evaluation of the durability of materials. The ideal conditioning matrix should be characterized by a low porosity, a low pore network and a sufficient mechanical strength. These properties should be preserved in the future for waste containment.