



Comparative study of the influence of sodium nitrate on the early-age hydration of Portland cement and a low-carbon binder

Jdaini Jihane^{*}(¹), Jehle Simon(¹), Arghir Andréa(¹), Cau Dit Coumes Céline(¹)

(¹) CEA, DES, ISEC, DPME, SEME, Univ Montpellier, Marcoule, France

* Jdaini Jihane, email: jihane.jdaini@cea.fr

Abstract

The decommissioning of nuclear facilities generates highly saline radioactive wastes, such as evaporator concentrates, commonly immobilized using Portland cement-based matrices. As decarbonization drives a decline in high-clinker cements (CEM I), low-carbon alternatives must be assessed for waste cementation.

This work investigates the effect of NaNO_3 , used as a representative salt, on the early-age behavior of a CEM I and a low-carbon CEM II binder containing clinker, calcined clay and limestone. NaNO_3 was added to the mixing solution at concentrations from 0 to 7 mol/L. A calcined clay – portlandite - gypsum model system was also studied to clarify calcined clay reactivity. Paste evolution was monitored by rheometry, calorimetry, mechanical testing, and mineralogical/microstructural analyses.

Increasing NaNO_3 delayed hydration and reduced early-age compressive strength in both binders; the underlying mechanisms are discussed using complementary dissolution and nucleation experiments.