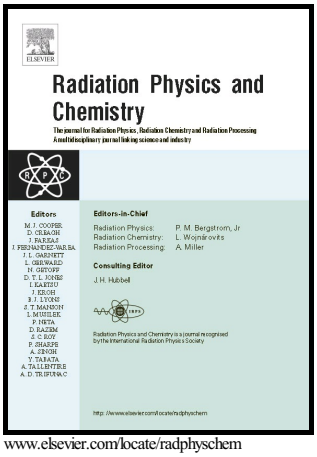
Author's Accepted Manuscript

Original behavior of pore water radiolysis in cement-based materials containing sulfide: coupling between experiments and simulations

P. Bouniol, W. Guillot, V. Dauvois, W. Dridi, S. Le Caër



www.elsevier.com/locate/radphyschem

PII: S0969-806X(18)30035-5
DOI: https://doi.org/10.1016/j.radphyschem.2018.04.021
Reference: RPC7828

To appear in: *Radiation Physics and Chemistry*

Received date: 12 January 2018
Revised date: 23 March 2018
Accepted date: 19 April 2018

Cite this article as: P. Bouniol, W. Guillot, V. Dauvois, W. Dridi and S. Le Caër, Original behavior of pore water radiolysis in cement-based materials containing sulfide: coupling between experiments and simulations, *Radiation Physics and Chemistry,* https://doi.org/10.1016/j.radphyschem.2018.04.021

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Original behavior of pore water radiolysis in cement-based materials containing sulfide: coupling between experiments and simulations

P. Bouniol[a,*], W. Guillot[a], V. Dauvois[a], W. Dridi[a], S. Le Caër[b]

[a] *DEN-Service d'Etude du Comportement des Radionucléides, CEA, Université Paris-Saclay, F-91191 Gif-sur-Yvette Cedex, France.*

[b] *LIONS, NIMBE UMR 3685, CEA, CNRS, Université Paris Saclay, CEA Saclay, F-91191 Gif-sur-Yvette Cedex, France.*

[*]Corresponding author, E-mail address: pascal.bouniol@cea.fr

Accepted manuscript

ABSTRACT

Blended cements with high content of blast furnace slag (CEM III/C) can be used for nuclear waste conditioning because of their low hydration heat as compared to ordinary Portland cements (CEM I). They however contain some sulfide, an impurity whose role needs to be investigated. Indeed, they can have an effect on the radiolytic H_2 production under irradiation. To study the impact of sulfide species on H_2 production, gamma irradiation, at a dose rate of 356 Gy h^{-1}, was performed during 6 months in a closed system without O_2 on a cement paste made with CEM III/C. At short time, the radiolytic H_2 production rate is higher than that measured using CEM I. On the basis of reaction data collected in the literature on sulfur species, radiolysis simulations performed for both systems confirm this behavior. Moreover, they suggest that the sulfide concentration, initially imposed in pore solution by the slag is of the order of 180 mM, and is responsible for this H_2 production. For the first two irradiation months, the following phenomena are then evidenced in CEM III/C: 1) conversion of sulfide into polysulfide anions; 2) pH increase; 3) production of H_2 due to the $H^{\bullet}$+ H_2S reaction having a very high rate constant. Nevertheless, in the medium term, the residual sulfide

Download English Version:

https://daneshyari.com/en/article/8251248

Download Persian Version:

https://daneshyari.com/article/8251248

Daneshyari.com