Desalination and Water Treatment
www.deswater.com

doi: 10.1080/19443994.2013.827300

52 (2014) 805–815
January

Taylor & Francis
Taylor & Francis Group

Reactivity of different cement minerals in presence of Fe(II) for reducing trichloroethylene

Praveen A. Ghorpade, Jung-Hwan Kim, Won-Ho Choi, Joo-Yang Park*

Department of Civil and Environmental Engineering, Hanyang University, 17 Haengdang-dong, Seongdong-gu, Seoul, Korea
Tel. +82 2 2220 0411; Fax: +82 2 2220 1945; email: jooypark@hanyang.ac.kr

Received 19 March 2013; Accepted 6 May 2013

ABSTRACT

Ferrous iron Fe(II) in combination with Portland cement is effective in dechlorinating trichloroethylene (TCE). However, there is no clear evidence about the component in cement responsible for TCE dechlorination. In present study different cement hydration minerals, such as ettringite (AFt) and monosulfate (AFm) were synthesized separately in laboratory. The TCE dechlorination ability of these minerals in combination with Fe(II) was investigated. It was found that these minerals in pure form do not have TCE dechlorination capacity. Further α-hematite (α-Fe_2O_3) that is suspected reactive mineral in cement/Fe(II) was investigated. It was found that when extra pure α-Fe_2O_3 along with CaO/Fe(II) was used for TCE did not show any reduction potential. This result was contradictory to earlier researchers, who used α-Fe_2O_3/CaO/Fe(II) for dechlorination of TCE. Thus, the α-Fe_2O_3 (Bayferrox-110 M) used by earlier researchers was investigated and it was found that it had some other impurities present in it. These impurities were suspected to play significant role in dechlorination of TCE. Further detailed studies were carried out and α-Fe_2O_3 was synthesized by following manufacturing procedure given for α-Fe_2O_3 (Bayferrox-110 M). When such α-Fe_2O_3 was used for TCE reduction, it showed improved reactivity. Detailed investigations showed that the α-Fe_2O_3 not in pure form but in combination with other impurities has reduction capacity for TCE.

Keywords: TCE; Ettringite; Monosulfate; α-Fe_2O_3; Reduction

*Corresponding author.

Presented at the Fifth Annual International Conference on "Challenges in Environmental Science & Engineering—CESE 2012" Melbourne, Australia, 9–13 September 2012

1944-3994/1944-3986 © 2013 Balaban Desalination Publications. All rights reserved.