Efficiency of composite permeable reactive barriers for the removal of Cr(VI) from leachates

K. Komnitsas, G. Bazdanis, G. Bartzas

School of Mineral Resources Engineering, Technical University Crete, 73100 Chania, Greece, Tel. +30 28210 37686; Fax: +30 28210 69554; email: komni@mred.tuc.gr (K. Komnitsas), Tel. +30 28210 37674; email: gbazdanis@gmail.com (G. Bazdanis)

School of Mining and Metallurgical Engineering, National Technical University of Athens, 15780 Greece, Tel. +30 210 7722181; email: gbartzas@metal.ntua.gr

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ABSTRACT

The present paper uses a novel approach and aims to assess the efficiency of composite permeable reactive barriers (PRBs) containing organic material and elemental sulphur for the clean-up of leachates containing Cr(VI) and acetate. The paper also aims to identify the main mechanisms involved in the removal of Cr(VI). Experiments were carried out in laboratory plexiglas columns, with a diameter of 5 cm and length of 50 cm. The feed contained 10 mg L\(^{-1}\) Cr(VI) and chemical oxygen demand (0.6 or 6 g L\(^{-1}\)). Under the optimum experimental set-up, the PRB exhibited over a period of 270 d excellent Cr(VI) decontamination potential. X-ray diffraction, scanning electron microscopy and energy dispersive spectrometry as well as Fourier transform infrared spectroscopy were used to characterize the exhausted reactive material, identify newly formed mineral phases and elucidate Cr(VI) removal mechanisms. Sorption of the reduced Cr(III) on the organic material as well as precipitation, mainly as Cr(OH)\(_3\), are the main Cr(VI) removal mechanisms.

Keywords: Characterization; Cr(VI); Hydrogen sulphide; Mechanisms; Permeable reactive barriers

*Corresponding author.

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