Effect of solvent type on removal and recovery of hexavalent chromium from industrial wastewaters

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ABSTRACT

Metals, especially chromium exists in a wide range of concentrations in natural water and wastewaters from various industrial operations. Reactive liquid extraction can be used for removing chromium. In this report, equilibrium experiments are presented on the removal of hexavalent chromium (Cr(VI)) using Aliquat 336 in various non-traditional solvents. The solvents are sunflower oil (fresh and recycled) and lubricating oil (fresh and recycled). The results are presented for the removal of Cr(VI) from aqueous solutions in the concentration range 0.5–500 ppm using Aliquat 336 (in the range 1.0–20% (v/v)). It is shown that sunflower oil and lubricating oil, both in the fresh and recycled forms, are able to remove Cr(VI) from ground waters and industrial wastewaters at their natural pH (range 6–8). These solvents gave satisfactory percentage extractions, producing water that can be recycled and they also offer advantages from health and safety, and environmental points of view. The results of the re-extraction process using KCl, K₂CO₃ and seawater are also presented. Seawater at its natural pH of 8 has shown potential for re-extraction. The findings have been applied to remove Cr(VI) from complex industrial wastewaters. The results provide good guidelines to the development of Cr(VI) removal and recovery processes using renewable, biodegradable, safe and cheap solvent systems demonstrated in this paper.

Keywords: Chromium; Removal; Sunflower oil; Recovery; Seawater