

## Experimental and modeling of the electrodialytic and dialytic treatment of a fly ash containing Cd, Cu and Pb

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**Abstract** A one-dimensional model is developed for simulating the electrodialytic and dialytic treatment of a fly ash containing cadmium, copper and lead. Two experimental systems have been used, a column of ash and a stirred ash suspension. The movement of Cd, Cu and Pb has been modeled taking into account the diffusion transport resulting from the concentration gradients of their compounds through the membranes and boundary layers and the electromigration of their ionic, simple and complex species during the operation. The model also includes the electromigration of the non-contaminant most important principal ionic species in the system,  $H^+$  and  $OH^-$ , proceeding of the electrolysis at the electrodes,  $Ca^{2+}$ ,  $CO_3^{=}$ ,  $SO_4^{=}$ , etc. proceeding from the ash and  $Na^+$  and  $NO_3^-$ , or citrate and ammonium ions incorporated as electrolyte solutions and/or as agent solution during the ash treatment. The simulation also takes into account that  $OH^-$  generated

on the cathode, during the electrodialytic remediation, is periodically neutralized by the addition of nitric acid in the cathode compartment. The anion and cation-exchange membranes are simply represented as ionic filters that preclude the transport of the cations and anions, respectively, with the exception of  $H^+$  which is retarded but pass through the anion-exchange membrane.

**Keywords** Electroremediation · MSW-fly ash · Heavy metals · Modeling

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