Characterization and electrodialytic treatment of wood combustion fly ash for removal of cadmium

Due to a high content of macronutrients and a potential liming capacity, recycling of ashes from biomass combustion to agricultural fields as fertilisers and/or for soil improvement is considered in Denmark and other countries utilising biomass as an energy source. However, the fly ash fractions especially contain amounts of the toxic heavy metal cadmium that may exceed the limiting values for agricultural utilisation given by the Danish Environmental Protection Agency. In this work the advances of using an electrodialytic remediation method to reduce the Cd content in wood combustion fly ash for the aim of recycling was described. Initial characterisation of the experimental ash showed that the Cd content exceeded the limiting values for agricultural use and therefore needed treatment before being recycled. The pH in the ash was very high (13.3), and the Cd was not soluble at these alkaline conditions. However, significant amounts of Cd could be extracted at neutral to alkaline conditions using an ammonium citrate solution as a desorption agent. Electrodialytic remediation experiments showed that, under optimised remediation conditions using a mixture of ammonium citrate (0.25M) and NH₄OH (1.25%) as an assisting agent, more than 70% of the initial Cd could be removed from the wood fly ash. The results also indicated that a continuous out-separation of Cd from the aqueous process solutions is possible. Thereby, recycling of the (nutrient rich) process solutions as well as of the remediated ash seems achievable.

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