Screening of sorbents and capture of lead and cadmium compounds during sewage sludge combustion

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Abstract

Current understanding has shown that aluminosilicate- and calcium-based sorbents could be applied to control trace metals emission from combustion and incineration processes. However, the use of industrial commercial sorbents is not always appropriate. The present study dwells on the use of natural and waste materials as sorbents to capture lead and cadmium compounds during combustion. The main task is to optimize the use of those materials by screening them, using a thermobalance. Then, the determined optimum sorbent was tested on an electrically heated drop tube furnace, burning sewage sludge at temperatures ranging from 1073 to 1223 K. The results showed that some of aluminosilicate-based sorbent were more effective than calcium-based sorbents. Kaolin was found to be a relatively effective sorbent for Pb and Cd capturing. The results further showed that the capture ability depended on chemical compositions and specific surface area of the sorbents. Presence of HCl caused a little decrease in the capture ability, using aluminosilicate-based sorbents, while significant effect on the capture processes was noted when calcium-based sorbents were used. Furthermore, when kaolin was added into the sewage sludge, kaolin was an appropriate sorbent to control lead and cadmium emissions. Temperature increase enhances the capture ability under our experimental conditions. Kaolin addition played a role for low leachability of the trace metals.

Keywords

Particulates matter;
Trace metals;
Sorbent;
Sewage sludge