Fluorine detoxification mechanisms of spent potlining incineration in response to calcium compounds

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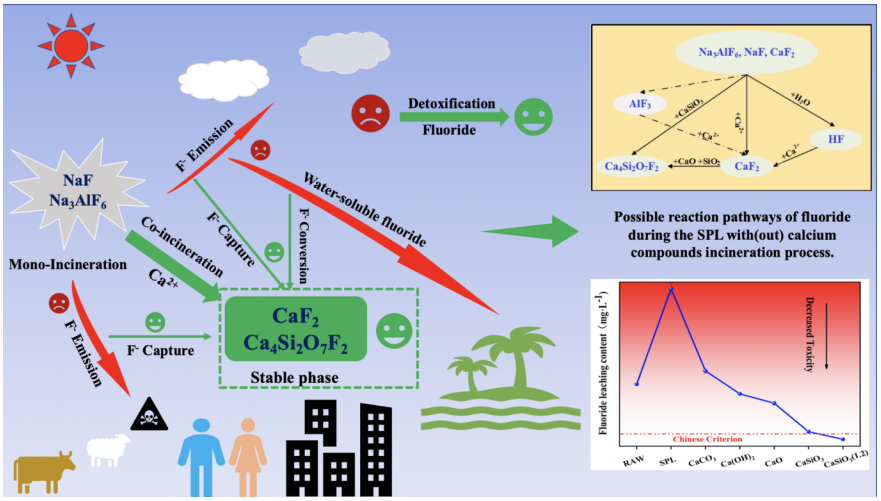
Abstract

In this study, the detoxification and distribution mechanisms of fluorine during the spent potlining (SPL) incineration were characterized. CaSiO3, CaO, Ca(OH)2, and CaCO3-assissted SPL incineration detoxified NaF in the bottom ash yielding a conversion range of 54.24 to 99.45% relative to the individual SPL incineration. The fluorine leaching content of the bottom ash was estimated at 13.71 mg?L-1 after the SPL co-incineration with CaSiO3 (Ca:F=1.2:1). The two main mechanisms of the fluorine transformation were the substantial formations of CaF2, and Ca4Si2O7F2. The fluorine transformation efficiency was greater with CaSiO3 than CaO, Ca(OH)2, and CaCO3. Fluorine during the SPL co-incineration with CaSiO3 (Ca:F=1.2:1) at 850 °C for 60 min was partitioned into 83.37, 13.90 and 2.72% in the bottom ash, fly ash, and flue gas, respectively. The transformation and detoxification mechanisms of fluorine provide new insights into controls over fluorine emission from the SPL incineration.



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