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The Effect of Sulfur and Calcium on the Formation of Dioxin in a Bubbling Fluidized Bed Incinerator

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Abstract : For the incineration process, the inhibition of dioxin formation is an important issue. Many investigations indicate that adding sulfur compounds in the combustion process can be an effectively inhibition for the dioxin formation. In the process, the ratio of sulfur-to-chlorine plays an important role for the reduction efficiency of dioxin formation. Ca-base sorbent is also a common used for the acid gas removing. Moreover, that is also the indirectly way for dioxin inhibition. Although sulfur and calcium can reduce the dioxin formation, it still have some confusion exists between these additives. To understand and clarify the relationship between the dioxin and simultaneous addition of sulfur and calcium are presented in this study. The experimental data conducted in a pilot scale fluidized bed combustion system at various operating conditions are analysis comprehensively. The focus is on the dioxin of fly ash in this study. The experimental data in this study showed that the PCDD/Fs concentration in the fly ash collected from the baghouse is increased slightly as the simultaneous addition of sulfur and calcium. This work described the CO concentration with the addition of sulfur and calcium at the freeboard temperature from 800°C to 900°C, which is raised by the fuel complexity. The positive correlation exists between the dioxin concentration and CO concentration and carbon contained in the fly ash.. At the same sulfur/chlorine ratio, the toxic equivalent quantity (TEQ) can be reduced by increasing the actual concentration of sulfur and calcium. The homologue profiles showed that the P_5CDD and P_5CDF were the two major sources for the toxicity of dioxin. 2,3,7,8-TCDD and 2,3,7,8-TCDF reduced by the addition of pyrite and hydrated lime. The experimental results showed that the trend of PCDD/Fs concentration in the fly ash was different by the different sulfur/chlorine ratio with the addition of sulfur at 800°C.

Keywords : reduction of dioxin emissions, sulfur-to-chlorine ratio, de-chlorination, Ca-based sorbent
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