The removal of Hg^0 from coal-fired flue gas by wet oxidation

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Abstract: Hg^0 emission from coal-fired flue gas has become a great public concern due to its hazards for human health and ecosystem. The wet oxidation has received wide attention in the removal of Hg^0 because of its low cost and synergy with other processes. A series of oxidants ($KMnO_4$, H_2O_2, $NaClO_2$, NaClO, $K_2S_2O_8$ and, K_2FeO_4) were selected in this study to remove Hg^0 from simulated flue gas in a packed tower, and the composite oxidant $NaClO/NaClO_2$ showed a better removal efficiency. Thermodynamic analysis on Hg^0 removal with composite oxidants was carried out, and experimental results indicated that the removal efficiency reached 94% at the reaction temperature of 50 °C. The physicochemical characteristics of solid products were studied through SEM (scanning electron microscopy) and XRD (X-ray diffraction), and the amount of mercury was detected by AAS (atomic absorption spectrophotometry). Results showed that 23% of Hg^0 was oxidized and transferred into the gypsum in the form of compounds, while 77% was oxidized into Hg^{2+} in the absorption solution. The findings of this research might provide a practical reference for promoting the removal of Hg0 from coal fired flue gas by $NaClO/NaClO_2$ with limestone in industrial application.

Keywords: coal fired flue gas; Hg^0 removal; wet oxidation; complex oxidants.