Fundamentals on Vaporization Behavior of Trace Metal Compounds at Different Atmospheres and Temperatures

abstract

Trace metals are usually inevitably contained in wastes, coals and so forth. When the wastes and/or coals are burnt, pollutants like NOx, SOx, soot, particulates, dioxins and heavy metal compounds are emitted from the furnaces. Some of the heavy trace metal compounds condense on the particle surface and/or form fine particulates during the combustion/incineration processes. Owing to the difficulties in capturing those fine particulates by means of conventional dust collection systems, those particulates tend to be exhausted into the atmosphere. In this study, fundamental behavior of the vaporization of Pb, Cd and Cr compounds was studied at relatively low temperature. In this experiment the effects of temperature and reaction atmosphere on the vaporization behavior of Pb, Cd and Cr compounds were studied using a thermobalance. The chemical thermoequilibrium calculation for each compound was also carried out in order to validate the experimental results obtained. As a result, the vaporization behavior of the metal compounds appears dependent on their respective melting points. Most of chlorides were easily vaporized at relatively low temperatures. This suggests that the presence of HCl enhances the vaporization of metal compounds, while co-existence of SO2 shows inhibition of the vaporization tendencies of Pb and Cd compounds. All of the Cd compounds vaporized in the reducing conditions. The results of chemical thermoequilibrium calculation agreed closely with the experimental results obtained.