Short Communication

In-Situ Oxygen Measurement by a YSZ Oxygen Sensor During Sewage Sludge Combustion

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Combustion experiments with in-situ oxygen measurement were performed to evaluate the impacts of oxygen alteration on the incineration of dried sewage sludge. Consequently, temperature was linked to the sludge combustion process, and the effects were mainly shown in the reaction rate of sludge combustion, EMF and θ curves, where the combustion temperature of 800 °C decreased much more rapidly than that of 600 °C, and the combustion process reached a final stable state much faster when a high temperature was adopted than when a low temperature was adopted. The oxygen concentration was an important factor for the combustion of sewage sludge since it significantly influenced the oxidation rates of the organic compounds in the sludge samples. However, the amount of oxygen consumption was not affected by the oxygen concentration if the sludge was well combusted; it directly proportionally changed with the change in sludge amount. This relationship can be potentially used to evaluate the pollution levels in solid wastes, such as sewage sludge, which will be very interesting and worthy of further investigation. Organic carbon in organic compounds was converted into inorganic carbon during the sludge combustion process and resulted in almost 100% of TOC removal. Probably due to the coalescence of the produced phosphorus oxide with non-flammable inorganic substances, the TP levels were much higher than the TOC, TN, TS and TCI levels in the ashes. For the extensive thermal disposal of sewage sludge, measures must be taken to mitigate the potential risk of gaseous toxic emissions produced by these treatments.

Keywords: combustion; sewage sludge; oxygen concentration; sensor; in-situ measurement

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