

Reactivation of Partially Sulfated CFBC Ash and Limestone with Steam and Liquid Water

Yinghai Wu, Edward J. Anthony and Lufei Jia

CANMET Energy Technology Centre – Ottawa
1 Haanel Dr, Ottawa, ON K1A 1M1, Canada

KEYWORDS: CFBC ash, limestone, reactivation, hydration, sulfation

ABSTRACT

It is not unusual for the bed ash produced from fluidized bed combustion technology to contain 20-30% of unreacted CaO when burning high sulfur fuels. In an effort to improve the sorbent utilization, reactivating the unused CaO with water or steam is a promising technique. This study summarized the results of reactivating partially sulfated CFBC ash with liquid water and saturated steam. In addition, CFBC bed ash, from Nova Scotia Power's 170 MW Circulating Fluidized Bed boiler at Point Aconi Power Generation, was hydrated with partial pressure steam in a thermogravimetric analyzer. This is achieved by modification of the existing TGA with accommodating a steam generation system, so that re-sulfation experiment can be carried out immediately after hydration. The hydrated samples were subsequently re-sulfated in the TGA with pre-mixed synthetic flue gas to evaluate the result of reactivation. For comparison, experiments were carried out on various limestones, including the one used at Point Aconi CFB boiler. Limestones were fully sulfated in TGA and partial-pressure-steam hydration and re-sulfation processes were repeated likewise the bed ash samples. The current results show that while liquid water and steam (both saturated and at partial pressure) successfully hydrate and reactivate the unreacted CaO in the bed ash, ashes so treated sulfated to widely different extents. This study also explores the effect of partial-pressure-steam hydration in TGA on the reactivation of limestones with different sulfation patterns, i.e. unreacted core, network/patchy and uniform, as proposed elsewhere, and shows that reactivation is possible for all of these types of limestone.

Submitted for consideration in the World of Coal Ash 2007 Conference, held May 7-10, 2007