EFFECT OF BED MATERIALS AND ADDITIVES ON THE SINTERING OF COAL ASHES RELEVANT TO AGGLOMERATION IN FLIDIZED BED COMBUSTION

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Abstract

Agglomeration propensity of Thai low-rank coal ashes was determined by measuring the compressive strength of sintered ash pellets over the temperature range of fluidized bed combustion. Physical and chemical changes of the sintered products were ascertained from scanning electron microscope-energy disperxive X-ray detection (SEM-EDX) and X-ray diffractometry (XRD). A clear difference existed in the strength-temperature relationship between these ashes. This difference was attributed to the role and relative amounts of clays and anhydrite components that form the low temperature melting eutectics. The bed materials (sand, CaO, $CaCO_3$, and $CaSO_4$) and additives (gibbsite and andalusite) when combined with the ashes caused a strength reduction due to the inert dilution effect that prevented the interaction of anhydrite and clays. To comprehend the mechanism of sintering and bed agglomeration more clearly, modified ashes which produced extra amount of amorphous silicate materials were prepared and tested. The bed materials and additives, when sintered with these modified ashes, gave reduction of pellet strength by varying extents based on three possible mechanisms namely, a pure inert effect, an inert/reaction effect and an inert/adsorption effect, with gibbsite being the most effective. Of the four test ashes, Lanna ash was the only ash that exhibited almost no strength development under all conditions, due principally to its very low clays content and relatively stable forms of mineralogical compositions.

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