

## Fluidized-Bed Combustion of Biomass with Elevated Alkali Content: A Comparative Study between Two Alternative Bed Materials

**Authors :** P. Ninduangdee, V. I. Kuprianov

**Abstract :** Palm kernel shell is an important bioenergy resource in Thailand. However, due to elevated alkali content in biomass ash, this oil palm residue shows high tendency to bed agglomeration in a fluidized-bed combustion system using conventional bed material (silica sand). In this study, palm kernel shell was burned in the conical fluidized-bed combustor (FBC) using alumina and dolomite as alternative bed materials to prevent bed agglomeration. For each bed material, the combustion tests were performed at 45kg/h fuel feed rate with excess air within 20-80%. Experimental results revealed rather weak effects of the bed material type but substantial influence of excess air on the behaviour of temperature, O<sub>2</sub>, CO, CxHy, and NO inside the reactor, as well as on the combustion efficiency and major gaseous emissions of the conical FBC. The optimal level of excess air ensuring high combustion efficiency (about 98.5%) and acceptable level of the emissions was found to be about 40% when using alumina and 60% with dolomite. By using these alternative bed materials, bed agglomeration can be prevented when burning the shell in the proposed conical FBC. However, both bed materials exhibited significant changes in their morphological, physical and chemical properties in the course of the time.

**Keywords :** palm kernel shell, fluidized-bed combustion, alternative bed materials, combustion and emission performance, bed agglomeration prevention

**Conference Title :** ICSRD 2020 : International Conference on Scientific Research and Development

**Conference Location :** Chicago, United States

**Conference Dates :** December 12-13, 2020