

The Catalytic Effect of Inherent and Adsorbed Metals on the Pyrolysis and gasification of Biomass

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Lignocellulosic biomass organic and inorganic composition plays an important role in thermochemical conversion processes product distribution and energy balance. The indigenous alkali and alkaline earth metals present in the biomass may have a catalytic effect on the steam gasification reactions, resulting in higher gasification reactivities. In contrast, elements like Si, Al, and P tend to react with alkali and alkaline earth metals and inhibit their beneficial effect. In this regard, the inorganic ratio $K/(Si+P)$ has proved to be a valuable indicator of the biomass steam gasification reactivity and product yield. Under the same experimental conditions, samples with $K/(Si+P)$ higher than 1 followed a catalytic gasification behavior, resulting in higher gas yields and gas efficiencies in comparison to samples with $K/(Si+P)$ below 1. For its part, the biomass organic composition, especially the H/C and O/C ratios, seem to be related to the composition and heating value of the gaseous products, and not to the process gas yield. These results could be an important reference for real gasification facilities, to adapt the process parameters to the feedstock characteristics and application requirements.

Keywords: Biomass, inorganic species, gasification products yield, mechanisms