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The carbon dioxide gasification characteristics of biomass char samples and their effect on coal gasification reactivity during co-gasification

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Abstract

The carbon dioxide gasification characteristics of three biomass char samples and bituminous coal char were investigated in a thermogravimetric analyser in the temperature range of 850–950 °C. Char SB exhibited higher reactivities (R_i , R_s , R_f) than chars SW and HW. Coal char gasification reactivities were observed to be lower than those of the three biomass chars. Correlations between the char reactivities and char characteristics were highlighted. The addition of 10% biomass had no significant impact on the coal char gasification reactivity. However, 20 and 30% biomass additions resulted in increased coal char gasification rate. During co-gasification, chars HW and SW caused increased coal char gasification reactivity at lower conversions, while char SB resulted in increased gasification rates throughout the entire conversion range. Experimental data from biomass char gasification and biomass-coal char co-gasification were well described by the MRPM, while coal char gasification was better described by the RPM.

Key Words: *Biomass reactivity, co-gasification, reactivity modelling.*

1 Introduction

The use of biomass in energy applications has been receiving significant attention lately. Based on their chemical and structural characteristics, various biomass wastes and energy crops have been identified as possible feedstock for different energy applications (Mata et al., 2010). Woods, weeds, grasses, leaves, agricultural wastes and municipal wastes have found applications in the production of methane (Gunaseelan, 1997), fuel pellets (Liu et al., 2014),

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