Investigation on the high-temperature flow behavior of biomass and coal blended ash

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Abstract

The high-temperature flow behavior of biomass (straw) and coal blended ash was studied. The variation of viscosity and the temperature of critical viscosity with different straw content were investigated. It is found that the straw ash with high viscosity is unsuitable for directly gasification and the 20% straw content sample can effectively decrease the viscosity. The solid phase content and mineral matters variation calculated by FactSage demonstrates the change of viscosity. In addition, the network theory illustrates that the Si-O-Si bond decreases to improve the viscosity of 20% straw content sample. The variation of mineral matters in XRD analysis validates the change of viscosity. Furthermore, the temperature of critical viscosity and lowest operation temperature reach the minimum when the straw content is 20%. Hysteresis between heating and cooling process of the sample with 20% straw content is more obvious than that of the samples with 40% and 80% straw content.

Keywords: biomass ash; viscosity; FactSage; the temperature of critical viscosity; hysteresis.

1. Introduction

In recent years, biomass as a potentially significant source of renewable energy has attracted more attention (Xu et al., 2014). Biomass has the environmentally friendly characteristics which could contribute to reducing CO_2 emissions (Huo et al., 2014). However, the widely distribution and seasonal nature of biomass lead to increase the cost of storage and thus increase the operating cost of biomass-only power plants (Li et al., 2014 and Chen et al., 2013). Therefore,

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