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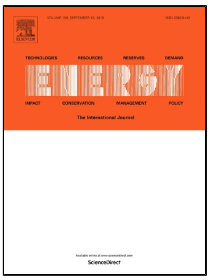

Slow pyrolysis of by-product lignin from wood-based ethanol production– A detailed analysis of the produced chars

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Slow pyrolysis of by-product lignin from wood-based ethanol production– A detailed analysis of the produced chars

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Abstract:

Slow pyrolysis as a method of producing a high-quality energy carrier from lignin recovered from wood-based ethanol production has not been studied for co-firing or blast furnace (BF) applications up to now. This paper investigates fuel characteristics, grindability, moisture uptake and the flow properties of lignin chars derived from the slow pyrolysis of lignin at temperatures of 300, 500 and 650 °C (L300, L500 and L650 samples respectively) at a heating rate of 5 °C min^{-1}. The lignin chars revealed a high mass and energy yield in the range of 39-73% and 53-89% respectively. Pyrolysis at 500 °C or higher, yielded lignin chars with low H/C and O/C ratios suitable for BF injection. Furthermore, the hydrophobicity of lignin was improved tremendously after pyrolysis. Pyrolysis at high temperatures increased the sphericity of the lignin char particles and caused some agglomeration in L650. Large and less spherical particles were found to be a reason for high permeability, compressibility and cohesion of L300 in contrast to L500 and L650. L300 and L500 chars demonstrated high combustibility with low ignition and burnout temperatures. Also, rheometric analysis showed that L500 has the best flow properties including low aeration energy and high flow function.

Keywords: biomass, lignin, slow pyrolysis, combustion

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