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Title: "Effect of Fast Pyrolysis Conditions on Structural Transformation and Reactivity of Herbaceous Biomasses at High Temperatures"

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Fast pyrolysis of wheat straw and rice husks was carried out in an entrained-flow reactor (EFR) and compared with the results from the wire-mesh reactor (WMR) in terms of the char yield at high-temperatures (1000-1500°C) to study the effect of heating rate, final temperature, ash content and particle size on the char yield. X-ray diffractometry (XRD), N-adsorption (BET), scanning electron microscopy (SEM), particle size analysis (CAMSIZER XT), nuclear magnetic resonance spectroscopy (²⁹Si NMR; ¹³C NMR) and electron spinning resonance spectroscopy (ESR) were conducted to investigate the effect of organic and inorganic matter on the char structural transformations. The results indicate no influence of the free radicals on char reactivity and burnout. The formation of free radicals in fast pyrolysis is related to the differences in the ash composition, namely presence of K⁺ ions in the wheat straw and formation silanol silicons at higher temperatures. The microscopy and 2D imaging analysis show that the differences in ash and extractives of rice husks and wheat straw affect significantly the char particle size and shape. The char yields of rice husks in the EFR, correspond to the WMR results, emphasizing its excellent properties as an ash tracer for the more precise recovery of elemental mass balances in pyrolysis.