

A pulsating H₂O approach to improve biochar reactivity and syngas quality: Insight into interactions of biochar-CO₂/H₂O

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Abstract

Interaction of biochar gasified in the mixed CO₂/steam is still unclear. In this study, the interactions between biochar with CO₂ (C-CO₂) and with steam (C-H₂O(g)) were systematically investigated using a TG analyzer and a tube furnace. Results show that the chemical reaction state and intrinsic ash were the essential reasons for the existing together of the three interaction effects between C-CO₂ and C-H₂O(g). Specially, an inhibitive effect occurred during the demineralized biochar gasified in the CO₂/H₂O(g) atmosphere, expressing that the C-CO₂ was inhibited by the C-H₂O(g) under the chemical reaction regime. A competitive effect was dominated the interactions of demineralized biochar-CO₂/H₂O(g) under either intra- or extra-particle mass transfer regime; while an evolution of “inhibition to competition” appeared under the diffusion reaction regime. The presence of intrinsic ash such as Ca element was conducive to the occurring of the synergistic effect

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