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Investigation of the Properties of Biochar Obtained by Dry and Wet Torrefaction in a Fixed and in a Fluidized Bed

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Abstract : We investigated the processing of poultry litter into biochar using dry torrefaction methods (DT) in a fixed and fluidized bed of quartz sand blown with nitrogen, as well as wet torrefaction (WT) in a fluidized bed in a medium of water steam at a temperature of 300 °C. Torrefaction technology affects the duration of the heat treatment process and the characteristics of the biochar: the process of separating CO_2, CO, H_2 and CH_4 from a portion of fresh poultry litter during torrefaction in a fixed bed is completed after 2400 seconds, but in a fluidized bed — after 480 seconds. During WT in a fluidized bed of quartz sand, this process ends in 840 seconds after loading a portion of fresh litter, but in a fluidized bed of litter particles previously subjected to torrefaction, the process ends in 350 - 450 seconds. In terms of the ratio between (H/C) and (O/C), the litter obtained after DT and WT treatment corresponds to lignite. WT in a fluidized bed allows one to obtain biochar, in which the specific pore area is two times larger than the specific pore area of biochar obtained after DT in a fluidized bed. Biochar, obtained as a result of the poultry litter treatment in a fluidized bed using DT or WT method, is recommended to be used not only as a biofuel but also as an adsorbent or the soil fertilizer.

Keywords : biochar, poultry litter, dry and wet torrefaction, fixed bed, fluidized bed
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