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BIOFUEL PRODUCTION FROM THE TORREFACTION OF UNFRIENDLY BIOWASTES USING CARBON DIOXIDE AS UPGRADED AGENT

Je-Lueng Shie and **Yi-Ru Liau**
National I-Lan University, Taiwan

Unfriendly biowaste (sweet potato vine, oil camellia shell and building demolition wood) will have adverse effects and harms on agricultural land and the environment, and it is not suitable for direct disposal and reuse on-site. The torrefaction procedures of cracking furnace and plasmatron reactor used in this study are advanced heat treatment technology. The gas, liquid and solid products can be achieved effectively from the thermal-treatment of unfriendly biowastes using carbon dioxide as upgraded agent at the high-temperature reactors. The operational parameters include furnace types, temperature, carrier gas, CO_2 concentration, batch and semi-batch feeding of samples etc. The samples from the pre-treatment, products of liquid, gas and solid from the experiment were all processed under the characteristic analyses, including approximately analysis, heating values, GC-MS, GC-TCD, EA, FTIR, TGA etc. The thermal effect of CO_2 in the exhaust gas on the torrefaction of the biowastes proved that CO_2 activation can accelerate and improve the calcination reaction. The main reaction mechanisms are water shift reaction and Boudouard reaction; it should be due to that the gaseous CO_2 reacted with H_2 and carbon, respectively, while resulting in the conversion from CO_2 to CO. This study confirmed that unfriendly biowaste not only can be converted into solid fuels completely but also a large syngas is produced. This technology shows a great future potential development.

BIOGRAPHY

Je-Lueng Shie is a Professor at the Department of Environmental Engineering, National I-Lan University, Taiwan. He has publications of 84 articles in scientific journals (including 66 SCI journals), 115 articles in conference proceedings, 37 reports, and five patents. His study fields are focusing on: thermal plasmatron technology; photoelectric material and catalyst applications; waste biomass refinery for advanced biofuels and biomaterials, and environmental pollution and GHG control.

jlshie@niu.edu.tw

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