Kinetic Characteristics of Blends of Hydrothermally Carbonized and Dry Torrefied Lignocellulosic Biomass

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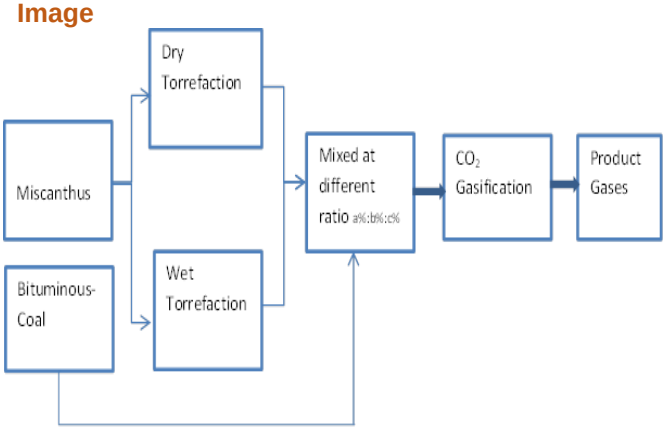
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Abstract

The main goal of this study is to investigate the kinetic characteristics and interaction of the carbon dioxide cogasification of blends of coal and thermochemically processed miscanthus (Miscanthus spp.) using thermogravimetric analysis (TGA) and Fourier Transform Infrared Spectroscopy (FTIR). Thermochemically processed miscanthus are prepared by wet torrefaction (WT), or hydrothermal carbonization (HTC) at 533K with residence time of 5 minutes at 5.5MPa pressure with 1:6 biomass-water mass ratio and dry torrefaction (DT) at 548K with residence time of 45 minutes at atmospheric pressure and blended with different ratios of coal. The kinetic characteristics show that the activation energy of the gasification of the processed biomass blends decreases with the increase in the biomass portion in the blends. Out of the blends tested, Coal-WT-DT at 60%:20%:20% shows the most synergistic interaction after analysis of TGA data. Hence, this ratio shows the most potential for replacing solid-fossil-fuel.

Image



Recent Publications (minimum 5) (If not leave as blank)

1. Acharya, B., & Dutta, A. (2016). Fuel property enhancement of lignocellulosic and nonlignocellulosic biomass through torrefaction. Biomass Conversion and Biorefinery, 6(2), 139-149.
2. Acharya, B., Dutta, A., & Minaret, J. (2015). Review on comparative study of dry and wet torrefaction. Sustainable Energy Technologies and Assessments, 12, 26-37.
3. Acharya, B., Pradhan, R. R., & Dutta, A. (2015). Qualitative and kinetic analysis of torrefaction of lignocellulosic biomass using DSC-TGA-FTIR.
4. Acharya, B., Roy, P., & Dutta, A. (2014). Review of syngas fermentation processes for bioethanol. Biofuels, 5(5), 551-564.
5. Acharya, B., & Dutta, A. (2013). Characterization of torrefied willow for combustion application. Journal of Biobased Materials and Bioenergy, 7(6), 667-674.
6. Acharya, B., Dutta, A., Mahmud, S., Tushar, M., & Leon, M. (2014). Ash analysis of poultry litter, willow and oats for combustion in boilers. J Biomass Biofuel,
7. Acharya, B., Sule, I., & Dutta, A. (2012). A review on advances of torrefaction technologies for biomass processing. Biomass Conversion and Biorefinery, 2(4), 349-369.



Biography

Bimal Acharya has his expertise in developing various bio-energy products from solid to liquid biofuel. He is a results-driven scholar with multi-faceted research experience in environmentally friendly energy options and is specialized in advanced biofuel energy systems and thermo-chemical science with hands-on experience in bioreactor design and performance of various tests in laboratory scale and pilot scale units. He has also more than 10 years experienced with solar and electrical power system for the application of cellular mobile and rural telecommunication in the rural part of Nepal..

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