JOINT EVENT

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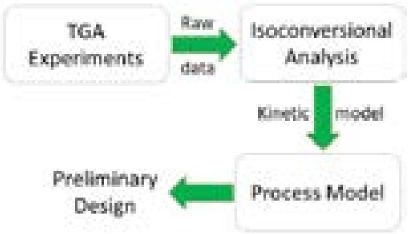
Biomass thermochemical processes suffer from the problem of feedstock variation. In the other words, in order to run commercial biomass-based plants under economically feasible conditions, the process have to be capable of handling ve different raw materials, ranging from forest residues to waste materials from various industries. Process modeling is crucial to predict the behavior of different feedstock materials in a given biomass plant. In this work, we consider the slow pyrolysis of biomass to produce biochar. In this process, the main quantity one aims at predicting by means of process modelling is th conversion of raw biomass to biochar as a function of the process conditions. To achieve this aim, the process model require a kinetic rate expression for describing the evolution of the biomass when subject to thermochemical treatment. Here, we will show that the TGA data processed with an isoconversional method is enough to obtain an effective rate expression whic allows for predicting the behavior of the biomass at an arbitrary temperature evolution. Such rate expressions can then be used in the process model to simulate conversion of raw biomass to biochar. An overview of this approach is shown in Fig 1. To illustrate the feasibility of the approach we will consider different biomasses feedstocks undergoing slow pyrolysis in an indirectly heated rotary kiln reactor. The results of our modeling are then compared to experimental data obtained from a 500 kW pilot plant pyrolyzer and to a more detailed process model. A high level of agreement between the modeling result from this approach and the experimental data and the previously validate detailed process model is observed. This proves the capability of our cost-efficient approach to obtain preliminary design data.



Recent Publications

1. Sadegh-Vaziri, R., Amovic, M., Ljunggren, R., & Engvall, K. (2015). A Medium-Scale 50 MWfuel Biomass Gasification Based Bio-SNG Plant: A Developed Gas Cleaning Process. Energies, 8(6), 5287-5302.
2. Sadegh-Vaziri, R., & Babler, M. U. (2017). Numerical investigation of the outward growth of ZnS in the removal of H2S in a packed bed of ZnO. Chemical Engineering Science, 158, 328-339.
3. Sadegh-Vaziri, R., & Babler, M. U. (2017). PBE Modeling of Flocculation of Microalgae: Investigating the Overshoot in Mean Size Profiles. Energy Procedia, 142, 507-512.
4. Babler, M. U., Phounglamcheik, A., Amovic, M., Ljunggren, R., & Engvall, K. (2017). Modeling and pilot plant runs of slow biomass pyrolysis in a rotary kiln. Applied Energy, 207, 123-133.
5. Samuelsson, L. N., Umeki, K., & Babler, M. U. (2017). Mass loss rates for wood chips at isothermal pyrolysis conditions: A comparison with low heating rate powder data. Fuel Processing Technology, 158, 26-34.

Biography

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