Exergy efficiency based design and analysis of utilization pathways of biomasses - DTU Orbit (21/10/2019)

**Exergy efficiency based design and analysis of utilization pathways of biomasses**

The utilization of biomasses has advantages with respect to energy conservation, emission reduction and resource utilization. In this paper, the concept of functional exergy efficiency is extended as a unified approach for evaluating the effective utilization of energy in three utilization pathways of biomasses; pyrolysis, gasification and anaerobic digestion. Based on our prediction model for higher heat value (HHV) of biomass, it has been shown that the Gibbs energy minimization method can be used to simulate the pyrolysis and gasification processes of biomasses. Biogas data of anaerobic digestion process is obtained through the practical biochemical methane potential (PBMP) model. Based on our chemical exergy prediction model of biomass, functional exergy efficiencies of utilization processes of biomasses (three kinds of straws and three kinds of manures) are evaluated. It is found that the functional exergy efficiencies of gasification process of manures and straws are all greater than those of the pyrolysis process at different temperatures, and compare with pyrolysis and gasification processes after 850 °C, the functional exergy efficiencies of anaerobic digestion are the lowest.

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