



Review

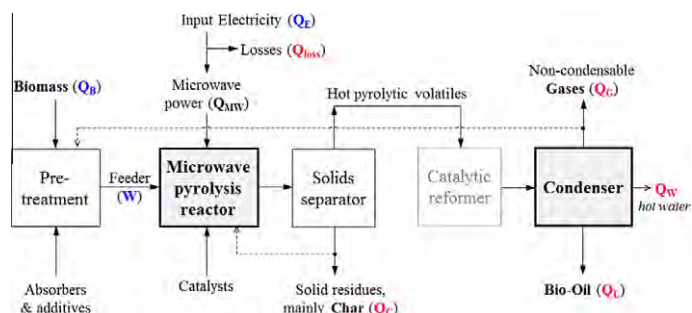
Microwave-assisted pyrolysis of biomass for liquid biofuels production

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GRAPHICAL ABSTRACT

Pyrolysis is an attractive way to produce liquid biofuels from biomass residues and waste feedstock. Various efforts have been made to improve pyrolysis process towards higher yield and quality of liquid biofuels and better energy efficiency. Microwave-assisted pyrolysis is one of the promising attempts, mainly due to efficient heating of feedstock by “microwave dielectric heating” effects. This review starts with a brief overview of the key factors and features of conventional pyrolysis design and summary of pyrolysis conditions that favor liquid biofuels production. Then the review compares microwave dielectric heating and conventional thermal heating. The key part of this review is that microwave-assisted pyrolysis process (from feedstock pretreatment to bio-oil collection, as sketched below) is thoroughly discussed, in which design and operation concerns are highlighted. A handy, up-to-date overview of the existing research and development efforts and results in microwave-assisted biomass pyrolysis is provided. This review is critical for helping understand the application of microwave heating in bioenergy and developing energy-efficient biomass conversion technologies. The microwave-assisted biomass pyrolysis process with the main energy flow is sketched below.



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ABSTRACT

Production of 2nd-generation biofuels from biomass residues and waste feedstock is gaining great concerns worldwide. Pyrolysis, a thermochemical conversion process involving rapid heating of feedstock under oxygen-absent condition to moderate temperature and rapid quenching of intermediate products, is an attractive way for bio-oil production. Various efforts have been made to improve pyrolysis process towards higher yield and quality of liquid biofuels and better energy efficiency. Microwave-assisted pyrolysis is one of the promising attempts, mainly due to efficient heating of feedstock by “microwave dielectric heating” effects. This paper presents a state-of-the-art review of microwave-assisted pyrolysis of biomass. First, conventional fast pyrolysis and microwave dielectric heating is briefly introduced. Then microwave-assisted pyrolysis process is thoroughly discussed stepwise from biomass pretreatment to bio-oil collection. The existing efforts are summarized in a table, providing a handy overview of the activities (e.g., feedstock and pretreatment, reactor/pyrolysis conditions) and findings (e.g., pyrolysis products) of various investigations.

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