

Controlled microwave-induced pyrolysis of waste rubber tires

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Abstrak

Pyrolysis is the thermal degradation of a carbonaceous solid by heat in the absence of oxygen. The feedstocks, such as biomass or solid wastes, are heated to a temperature between 400 and 600°C. The reaction produces three products: gas, pyro-fuel oil, and char. Pyrolyzing solid wastes to make pyro-oil and bio-char provides a renewable, low cost way to produce liquid fuel. The pyro-oil could be mixed with diesel fuel and the fuel properties suitable for a diesel engine generator could be investigated. This work uses a controlled microwave heating technique to pyrolyze used rubber tires into pyro-oil. The thermal treatment of received used rubber tires was done in a modified domestic microwave with a controlled heated stirred bed system. In earlier work, it was found that rubber tires are a poor absorber of microwaves. An appropriate microwave-absorbing material, such as activated char, was added to initiate the pyrolysis process, thus producing pyro-oil. The characteristics of this pyro-oil and the effect of the microwave absorber on the yield of pyro-oil are presented in the paper. Particular attention was paid to the temperature profile during microwave heating of the used rubber tires. The benefit of this application is the conversion of the waste tires into renewable and high calorific pyro-oil. In addition, properties of tire pyrolysis oil have been determined and compared with the results of commercial diesel fuel.