

Distributed Microwave Pyrolysis of Waste: Case of Polystyrene

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The scarcity of economically-viable crude oil has prompted chemical corporations to look for alternative sources of carbon and hydrogen to produce chemicals, biologics and other products. Biomass and waste matter are considered one of the foremost raw materials to develop all of these industries. Canada produces a tremendous amount of waste: 25 million tons (an average of 0.8 ton per capita), of which only 25% is diverted (Statistics Canada, 2008). The remaining 17 million tons per year is either incinerated or landfilled. This volume of waste is seen as an interesting biomass deposit and constitutes an opportunity to source alternative fuels and chemicals. The development and operation of centralized large scale pyrolysis plants to process domestic waste face several problems, which originate mainly from the wide-ranging composition of the feedstock. Also, these installations require a minimum volume of waste to be operational and cost effective as well as the collection and transportation of waste over long distances. Finally, process scale-up is extremely complex as the operation of large-scale pyrolysis units is subject to serious operational issues.

To address these problems, a distributed pyrolysis strategy is proposed, which involves the deployment of small scale reactors at the waste production source for onsite processing. This approach reduces significantly the cost of waste transportation and collection and offers alternative ways of valorizing the biogas, bio-oil, and char. This presentation will discuss the cost benefits of a distributed strategy, the implementation strategy as well as the pyrolysis of common elements found in a garbage bag. Moreover, the polystyrene pyrolysis will be discussed as an example of this technology.