INDUSTRIAL WASTE AS FEEDSTOCK FOR BIOFUEL AND BIOMATERIAL PRODUCTION

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ABSTRACT

Industrilisation, which is considered as the essence of modern development, however also results in higher levels of energy consumption accompanied with enormous increase in the amount and diversity of waste generation. Though Food and agro-industries typically produce goods for direct consumption from otherwise perishable agricultural crops, but also generates wastes which create a disposal as well as environmental problems if not properly managed. In developing countries like India, billions of tones of agro-industrial wastes are generated annually. The Jute industry occupies a significant place in Indian economy. The jute industry in India generates around 40,000 tonnes of processing waste as by–product, termed as jute dust. The major constituent of jute dust is unspinnable short jute fibres. Silghat Jute Mill, situated in Silghat area on the north bank of Brahmaputra river in the district of Nagaon, Assam handles jute for processing to various jute products. The waste i.e. just dusts donot find any use and are mostly dumped on the bank of the river closed to the mill, which may be a potential threat for water pollution.

The present work aims at utilization of this lingo-cellulosic industrial waste biomass through the process of pyrolysis. Pyrolysis has been established as a technique for conversion of wide-ranging biomass types including waste biomass into a liquid product called bio-oil and a solid char (biochar) is formed as a by-product. In the present investigation, jute-dust was subjected to pyrolysis at different terminal temperatures viz. 400, 500, 600 and 700 ^{0}C and the bio-oil and biochar produced were characterized. The elemental analyses and high heating values of the bio-oils and biochar produced at different terminal temperatures were determined. Further, chemical compositions of the bio-oils were investigated using chromatographic and spectroscopic techniques such as NMR, FTIR and GC-MS. The GC-MS study indicated that the bio-oil includes abundant oxygenated compounds. The elemental composition and physical properties of biochar show increase in carbon content, decrease in oxygen, hydrogen and nitrogen content, and increase in surface area and pore volume with increase in terminal temperatures of pyrolysis. Bio-oil yield increased from 23.5 to 43.45% and bio-char yield decreased from 45.67 to 16.33% with increase of terminal pyrolysis teperature. The study shows that an industrial waste biomass i.e. jute-dust have potential for conversion to bio-oil through the process of pyrolysis to supplement the petro-derived liquid fuel for transportation and the biochar produced can be used to sequester atmospheric carbon dioxide and enhance soil fertility.

Keywords: Industrial biowaste, Pyrolysis, Jute-dust, Bio-oil, Bio-char.