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Fire-tube Heating Pyrolysis of Car Tire Wastes: End Uses of Product Liquids as Fuels and Chemicals

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Abstract

Car tire wastes were pyrolysed in a fixed-bed fire-tube heating reactor system under nitrogen to determine the effect of final temperature, feed size and sweeping gas flow rate on the product yields and liquid product compositions. The highest liquid product yield was obtained at 475°C for feed size of 4cm³ and sweeping gas flow rate of 8L/min. Liquid products were characterized including fuel properties, elemental analyses, FT-IR, ¹H-NMR, GC-MS and distillation. The analytical results showed that the tire derived liquids are a complex mixture of C₅-C₁₇ organic compounds, with a lot of valuable single ring alkyl-aromatics (23.12%), a high value light hydrocarbon, limonene (11.11%), long-chain (including small amount of ring) hydrocarbons (30.94%) and oxygenated compounds (2.89%). The fuel properties and distillation data represent that the total pyrolytic liquid can be used as liquid fuel.

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