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Research Article

Production and Characterization of Maximum Liquid Oil Products through Individual and Copyrolysis of Pressed Neem Oil Cake and Waste Thermocol Mixture

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In this study, individual and copyrolysis experiments were performed with pressed neem oil cake (NOC) and waste thermocol (WT) to produce high grade liquid oil. The effects of reactor temperature, heating rate, feed ratio, and reaction time on product yields were investigated to identify the optimum parameters for maximum oil yield. The maximum oil yield of 49.3 wt%, 73.4 wt% and 88.5 wt% was obtained from NOC pyrolysis, copyrolysis, and WT pyrolysis under optimized conditions. During copyrolysis, the maximum oil product was obtained under NOC/WT ratio of 1 : 2 and at the temperature of 550°C. The liquid oils obtained from thermal and copyrolysis were subjected to detailed physicochemical analysis. When compared to biomass pyrolysis, the copyrolysis of WT and NOC had a substantial improvement in oil properties. The copyrolysis oil shows higher heating value of 40.3 MJ/kg with reduced water content. In addition to that, the copyrolysis oil obtained under optimized conditions is analyzed with Fourier transform infrared spectroscopy (FT-IR) and Gas chromatography–mass spectrometry (GC-MS) analysis to determine the chemical characterization. The analysis showed the presence of aliphatic and aromatic hydrocarbons in the oil.

1. Introduction

The need for energy in developing countries due to population growth leads to a shortage of resources. The necessity of renewable energy sources and efficient technologies for converting renewable sources into alternative fuels has now been recognized by the scientific community [1]. As a result, solar, hydro, wind, and biomass play an essential role in increasing renewable energy security with reduced pollution. The utilization of low polluting fuels like biomass has attracted more attention nowadays [2]. Furthermore, by 2035, biomass sources have the potential to contribute about 10% of global total energy consumption and biofuels will account for approximately 27% of global transportation fuels