

عنوان مقاله:

Impact of Organic Hydrocarbons on Fuel Properties and Engine Characteristics of Thermally Cracked Cashew Nut Shell Liquid

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خلاصه مقاله:

The present study aims to explore the role of characterized hydrocarbons in thermally cracked shell liquid in determining its overall fuel properties and combustion characteristics in a CI engine. For this purpose, waste shell liquid was extracted from waste cashew nut shell by means of cold extraction technique using a simple electrically operated mechanical screw press, which reported maximum extractable oil content as 17.7 %. In addition, it was thermally cracked at 350–400 °C using conventional heating for both lab-scale and pilot-scale extraction. Based on its chemical composition, raw shell liquid contained anacardic acid and cardol, while thermally cracked shell liquid had cresol and methyl oleate as their dominant hydrocarbon compounds. Their composition was found to be 51.84 %, 33.68 %, 43.87 %, and 28.49 %, respectively. According to their contribution, both cyclic and aromatic as well as linear-chained hydrocarbons exhibited significant effect on the fuel properties of the cracked shell liquid, with carbon atoms contributing to its physical and thermal properties, whereas cyclic and aromatic hydrocarbons enhance its flow characteristics. Next, neat and blend samples of this cracked shell liquid with petro diesel reported higher peak in-cylinder pressure by 5.6 % (on average) due to the presence of fatty acid esters, which induced early ignition and provided sufficient time for combustion. Meanwhile, higher emission levels were attributed by both cyclic and aromatic and linear-chained hydrocarbons, citing aromaticity and unsaturation in their molecules, which also resulted in reduced thermal efficiencies by 12.5 % (on average), upon accounting for their inferior calorific content. In conclusion, it is evident that hydrocarbons in these treated shell liquids play a significant role in their fuel properties and engine characteristics.

کلمات کلیدی:

cashew nut wastes, Thermal Cracking, screw press extraction, Anacardic acid, cresol

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