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Diesel-oxygenated fuels ternary blends with nano additives in compression ignition engine: A step towards cleaner combustion and green environment

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HIGHLIGHTS

- The diesel engine run with diesel/jatropha biodiesel/higher alcohol blends and GO additives.
- Brake specific fuel consumption reduced by up to 20% with the addition of GO.
- p_{max} and HRR improved with adding GO nanoparticles.
- UHC, CO, and soot emission reduced while NO_x enlarged with the addition of GO.
- NO_x, CO, UHC, and smoke emissions decreased for DJB, DJH, and DJO blends.

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ABSTRACT

The Jatropha biodiesel is a promising source to substitute diesel fuel, but it has some drawbacks like high viscosity. Thus, in this research attempts to enhance the utilization of Jatropha biodiesel in a CI engine by using higher alcohols and graphene oxide nano-additives (GO). The higher alcohols are n-butanol (B), n-heptanol (H), and n-octanol (O). Combines of 40 vol% diesel (D), 50 vol% biodiesel (J), and 10% alcohols (B, H, and O) are formulated as DJB, DJH, and DJO. These mixtures explored with and without the supplement of 50 mg/L of GO. The burning, exergy, and emissions features are scrutinized exploiting a CI engine. The average burning pressure and NRoHR are comparable for all analyzed fuels, with slight augmentation counted for DJBGO. GO additives advance the burning phasing with minimum delay times. DJO and DJB augment BTE by 10% and 13%, respectively. The implanting of GO enriches BTE by 15%. The UHC, and smoke intensity are lowered by 60%, 70, and 80%, respectively, whereas the NO_x intensity is engorged by 13%. It can be deduced that higher alcohols and GO facilitate increasing the Jatropha biodiesel fraction in the mixture with appropriate diesel engine performance enhancement.

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