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Experimental Investigation of the Effect of Different Metal Oxides Nanoparticles as Additives on Compression Ignition Engines

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ABSTRACT

Biodiesel is used as an alternative fuel in internal combustion engines. It produces lower carbon monoxide, unburned hydrocarbon, and particulate emissions when compared to that neat diesel. This experimental work aims to upgrade the characteristics of gases emitted, performance, and combustion of CI engine. The engine model is a HATZ-1B30-2 Gunt, single cylinder, four stroke, direct injection, air cool CI engine. Experiments are done at 2000 rpm constant speed and dissimilar loads using fuel blends. There are three different metal oxide additives used in this investigation. This includes Aluminium oxide (Al_2O_3) Magnesium oxide (MgO), and Zinc oxide (ZnO). They are all in nanoparticle size with various dosing levels of 50, 100, and 150 mg/L. Visual solubility tests are performed for the fuels. The newly developed fuel is burned immediately after preparation to avoid phase separation. B30 – 50 MgO is found to be the most economical modified fuel with a 19 % reduction in bsfc, and a 19 % increase in brake thermal efficiency, D100 – 100 Al_2O_3 has the highest peak pressure with a 3.3 % increase, D100 – 50 Al_2O_3 has the maximum heat release rate with a 4.6 % increase, Both of B30 – 150 Al_2O_3 and D100 – 150 MgO blends have the lower concentration of NOx emission with a 21.6 % reduction, and B30 – 150 Al_2O_3 blend has the lower concentration of CO emission with a 43.2 % reduction comparing to neat diesel at full load.