ScienceDirect

Materials Today: Proceedings

Volume 44, Part 5, 2021, Pages 3657-3665

Evaluation of metal oxide nano particles in lemongrass biodiesel for engine performance, emission and combustion characteristics

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https://doi.org/10.1016/j.matpr.2020.10.796

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Abstract

Physicochemical properties of lemongrass biodiesel and diesel engine parameters fueled with nanoparticles (Zinc Oxide, Titanium Oxide, and Alumina) added in diesel/biodiesel blended have been investigated, in which zinc oxide nanoparticles was green synthesized from Idenlandia leaf. The synthesized Zno Nps was characterized by Scanning Electron Microscope (SEM), X Ray Diffraction and FT-IR study. Each nanoparticles has own weightage of 50 ppm in 30% blend of lemongrass biodiesel/diesel. The performance, exhaust emission and combustion characteristics were performed for each lemongrass biodiesel nanoparticles blend using diesel engine and validation was carried out between each lemongrass biodiesel blends with diesel and ANOVA analysis was done to found out the dependency of parameters. It was concluded that characterization of ZnO, TiO_2 and Al_2O_3 nanoparticles such as XRD, SEM and FT-IR was conformed their behavior in anatase phase along with lemongrass oil also characterized by FT-IR. From ANOVA table, B3050ZnO has major significant dependence for brake thermal efficiency over 3%. It was concluded that lemongrass biodiesel with green synthesized zinc oxide nanoparticles has better performance, emission and combustion characteristics over 5% among other two nano-additives.

Introduction

Fossil fuels are dipping around the world along with that price of fossil fuel increasing gradually, to overcome a huge demand, evolution of fuels are needed which is biodiesel. Biodiesel was extracted from various leafs, seeds such as jatropha, mauha, pongamia, lemongrass oil etc. [1], [2], [3]. Major drawback is NOx emission are huge as compared diesel due to huge content of oxygen contamination in biofuels [4]. To overcome emission, Nanoparticles are used. Due to Nano-size of the particles and its characteristics, sedimentation was not possible.

Emissions like CO and HC are reduced and smoke opacity and NOx was increased by using TiO_2 but brake thermal efficiency was increased by 3.1%. Doping of nanoparticles such as zinc oxide and titanium oxide will