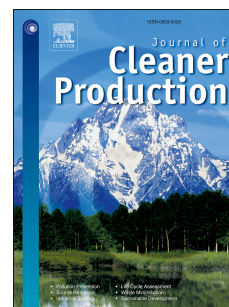


Accepted Manuscript

Experimental studies on the effect of metal oxide and antioxidant additives with Calophyllum Inophyllum Methyl ester in compression ignition engine

B. Ashok, K. Nanthagopal, Rayapati Subbarao, Ajith Johny, Aravind Mohan, A. Tamilarasu



PII: S0959-6526(17)31768-7

DOI: [10.1016/j.jclepro.2017.08.050](https://doi.org/10.1016/j.jclepro.2017.08.050)

Reference: JCLP 10308

To appear in: *Journal of Cleaner Production*

Received Date: 27 March 2017

Revised Date: 20 July 2017

Accepted Date: 6 August 2017

Please cite this article as: Ashok B, Nanthagopal K, Subbarao R, Johny A, Mohan A, Tamilarasu A, Experimental studies on the effect of metal oxide and antioxidant additives with Calophyllum Inophyllum Methyl ester in compression ignition engine, *Journal of Cleaner Production* (2017), doi: 10.1016/j.jclepro.2017.08.050.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Experimental Studies on the Effect of Metal oxide and Antioxidant Additives with Calophyllum Inophyllum Methyl Ester in Compression Ignition Engine

B.Ashok^a, K. Nanthagopal^{a*}, Rayapati Subbarao^b, Ajith Johnny^a,
Aravind Mohan^a, A.Tamilarasu^a

^aSchool of Mechanical Engineering, VIT University, Vellore-632014, India.

^bDepartment of Mechanical Engineering, NITTTR, Kolkata, India

* Email id: nanthagopalk@yahoo.com, Contact Number: +919943928066

Abstract

Biodiesels derived from the seeds of Calophyllum Inophyllum plants offer to be commercially viable alternative to conventional fossil fuel which can make compression ignition engines technologically cleaner. The fuel properties of biodiesel obtained are similar to that of diesel and are found in abundance in southern India, which makes it more commercially viable alternative to fossil fuels. Also, with the presence of additional oxygen molecules within the fuel itself, the hydrocarbon (HC) and carbon monoxide emissions associated with biodiesel are lower compared to conventional fossil fuels with only exception to oxides of nitrogen emissions. In the present work, the effect of two fuel additives namely, titanium dioxide(TiO₂) nanoparticle and butylated hydroxytoluene(BHT) on Calophyllum Inophyllum biodiesel is studied by observing the performance, emission and combustion characteristics on a twin cylinder CI engine. Results obtained from the experiments show that the nanoparticles are capable of enhancing the combustion process and they also act as an oxidising catalyst. Dispersion of 100ppm of TiO₂ nanoparticle resulted in the improvement of brake thermal efficiency by 4% at full load condition along with comparable reduction in emission levels. The tendency of BHT to inhibit the formation of free radicals also produces marginal improvement in performance characteristics and is found to be more effective in mitigating NO_x emissions, but adversely affecting HC and CO emissions. Addition of 500ppm of BHT to biodiesel results in 11.65% reduction of NO_x emissions at full load condition. Overall, the antioxidant provides better output in NO_x mitigation with the slight reduction of performance as compared to the metal oxide nanoparticle.

Keywords: Calophyllum Inophyllum; oxides of nitrogen; antioxidants; butylated hydroxytoluene; metal oxide; titanium oxide

Abbreviations

BHA	Butylated hydroxyanisole
BHT	Butylated hydroxytoluene
BMEP	Brake mean effective pressure
BSCO	Brake specific carbon monoxide
BSEC	Brake specific energy consumption
BSFC	Brake specific fuel consumption
BSHC	Brake specific unburned hydrocarbon
BSNO _x	Brake specific oxides of nitrogen emission
bTDC	Before top dead center
BTE	Brake thermal efficiency

Download English Version:

<https://daneshyari.com/en/article/5479923>

Download Persian Version:

<https://daneshyari.com/article/5479923>

[Daneshyari.com](https://daneshyari.com)