World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:13, No:01, 2019

Investigating the Effect of Ceramic Thermal Barrier Coating on Diesel Engine with Lemon Oil Biofuel

Authors : V. Karthickeyan

Abstract : The demand for energy is anticipated to increase, due to growing urbanization, industrialization, upgraded living standards and cumulatively increasing human population. The general public is becoming gradually aware of the diminishing fossil fuel resources along with the environmental issues, and it has become clear that biofuel is intended to make significant support to the forthcoming energy needs of the native and industrial sectors. Nowadays, the investigation on biofuels obtained from peels of fruits and vegetables have gained the consideration as an environment-friendly alternative to diesel. In the present work, biofuel was produced from non-edible Lemon Oil (LO) using steam distillation process. LO is characterized by its beneficial aspects like low kinematic viscosity and enhanced calorific value which provides better fuel atomization and evaporation. Furthermore, the heating values of the biofuels are approximately equal to diesel. A single cylinder, four-stroke diesel engine was used for this experimentation. An engine modification technique namely Thermal Barrier Coating (TBC) was attempted. Combustion chamber components were thermally coated with ceramic material namely partially stabilized zirconia (PSZ). The benefit of thermal barrier coating is to diminish the heat loss from engine and transform the collected heat into piston work. Performance characteristics like Brake Thermal Efficiency (BTE) and Brake Specific Fuel Consumption (BSFC) were analyzed. Combustion characteristics like in-cylinder pressure and heat release rate were analyzed. In addition, the following engine emissions namely nitrogen oxide (NO), carbon monoxide (CO), hydrocarbon (HC), and smoke were measured. The acquired performance combustion and emission characteristics of uncoated engine were compared with PSZ coated engine. From the results, it was perceived that the LO biofuel may be considered as the prominent alternative in the near prospect with thermal barrier coating technique to enrich the performance, combustion and emission characteristics of diesel engine.

Keywords : ceramic material, thermal barrier coating, biofuel and diesel engine
Conference Title : ICC 2019 : International Conference on Ceramics
Conference Location : Sydney, Australia
Conference Dates : January 30-31, 2019

Open Science Index, Materials and Metallurgical Engineering Vol:13, No:01, 2019 publications.waset.org/abstracts/102859/pdf