

Accepted Manuscript

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PII: S1359-4311(17)36635-8
DOI: <https://doi.org/10.1016/j.applthermaleng.2018.08.057>
Reference: ATE 12560

To appear in: *Applied Thermal Engineering*

Received Date: 16 October 2017
Revised Date: 29 June 2018
Accepted Date: 18 August 2018

Please cite this article as: M.S.M. Zaharin, N.R. Abdullah, H.H. Masjuki, O.M. Ali, G. Najafi, T. Yusaf, Evaluation on physicochemical properties of iso-butanol additives in ethanol-gasoline blend on performance and emission characteristics of a spark-ignition engine, *Applied Thermal Engineering* (2018), doi: <https://doi.org/10.1016/j.applthermaleng.2018.08.057>

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Evaluation on physicochemical properties of iso-butanol additives in ethanol-gasoline blend on performance and emission characteristics of a spark-ignition engine

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Abstract

In this study, experiments were conducted on a four-cylinder spark-ignition engine to investigate the effects of iso-butanol additives in ethanol-gasoline blend on fuel properties, performance and emission characteristics of a SI engine. The engine tests were carried out at 50% wide open throttle and variations of engine speed from 3000 to 5000 RPM with an interval of 1000 RPM. The engine was fueled with base gasoline fuel, ethanol-gasoline blended fuel at 10% volume percentage of ethanol (E10) and three different fuel blends of iso-butanol additives; 5%, 10% and 15%, in E10 blended fuel denoted as E10B5, E10B10 and E10B15, respectively. Physicochemical properties tests were conducted in this study to evaluate the fuel heating value, kinematic viscosity and density, which have been selected due to their influences on engine performance and exhaust emissions. Results of heating value showed a decreasing pattern for the blended fuel samples compared with that of base gasoline fuel as E10, E10B5, E10B10 and E10B15 produced 2.33%, 3.14%, 5.06%, and 5.31%, respectively. However, as alcohol concentration increases in the blended fuel samples, the density and kinematic viscosity were both increased with maximum values of 0.767 g/cm³ and 1.15 mm²/s, respectively obtained for E10B15. In terms of engine performance, the blended fuel samples exhibited

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