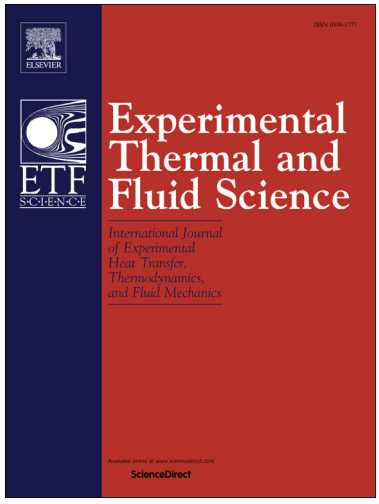

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PII: S0894-1777(16)30256-4
DOI: http://dx.doi.org/10.1016/j.expthermflusci.2016.09.010
Reference: ETF 8878

To appear in: *Experimental Thermal and Fluid Science*

Received Date: 9 July 2016
Revised Date: 14 September 2016
Accepted Date: 18 September 2016

Please cite this article as: A.R. Ghahremani, M.H. Saidi, A. Hajinezhad, A.A. Mozafari, Experimental investigation of spray characteristics of a modified bio-diesel in a direct injection combustion chamber, *Experimental Thermal and Fluid Science* (2016), doi: http://dx.doi.org/10.1016/j.expthermflusci.2016.09.010

Experimental investigation of spray characteristics of a modified bio-diesel in a direct injection combustion chamber

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Abstract

Macroscopic and microscopic characteristics of spray of a Modified Bio-diesel Fuel (MBF), applying direct injection system have been explored and compared with those of conventional diesel fuel. MBF is a new combination of bio-diesel, molasses bio-ethanol, and water, which has been kept as a single-phase bio-fuel, employing an emulsifier. Lower emissions and production costs, higher oxygen content and cetane number are the key advantages of the MBF to be replaced by conventional fossil fuels in internal combustion engines. Applying atomization model, the spray atomization properties such as Ohnesorge number and Sauter Mean Diameter (SMD) have been investigated. Air entrainment analysis has been studied employing quasi-steady jet theory. Furthermore, considering physics of atomization of droplets and employing dimensional analysis, a new non-dimensional number namely Atomization Index (AI) has been developed. AI number, which is the ratio of square of inertia forces to product of viscous and surface tension forces, can predict the atomization level of the spray. Results show that increasing AI number decreases SMD and improves atomization behavior of the spray as