

Università degli Studi di
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Facoltà di Ingegneria



Corso di Studi in
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Dipartimento di Ingegneria Industriale (Classe delle Lauree Magistrali N. LM33)

Tesi di Laurea

Effetto di una miscela butanolo-benzina sul processo di combustione in un motore a.c. iniezione diretta: caratterizzazione spettroscopica

Relatore:

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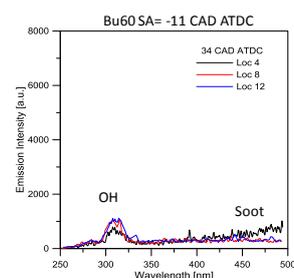
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ABSTRACT

Fuel efficiency and emission reduction represent the main challenge for automotive industry. Moreover, the shortage fossil oil provision induces researchers to focus their attention to alternative fuels. The aim is to replace petrol fuels, attempting to reduce exhaust emission without compromise engine performance. This study presents the results of an optical investigation performed to characterize the combustion of a 60%v butanol-40%v gasoline blend in a direct injection SI engine. Experiments were performed in a single cylinder engine equipped with the head of a commercial turbocharged engine and a GDI injection system. An elongated piston with a quartz window provided the optical access. Blend of commercial gasoline and butanol (60% by volume) were tested at lean mixture conditions. Experiments were performed at 2000 rpm through conventional tests (based on in-cylinder pressure measurements and exhaust emission analysis) and through optical diagnostics. In particular, UV-visible natural emission spectroscopy was applied to investigate the formation and the evolution of the main compounds (such as CN, NH, OH, CH, HCO) characterizing the spark ignition and combustion process. All the optical data were correlated to the in-cylinder pressure-based data and to the exhaust emission measurements. While several differences were observed when changing the fuel from commercial gasoline to the blend containing n-butanol 60% volumetric concentration, the general conclusion is that the reference fuel can be replaced with alcohol based fuel up to the aforementioned concentration in DISI engines without any penalty on performance or regulated emissions. Moreover, the use of butanol-gasoline blend induced an improvement of combustion stability at lean mixture condition. Also, smoke opacity was reduced.



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