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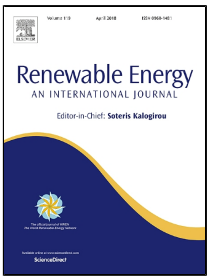

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Comparison of late PCCI combustion, performance and emissions of diesel engine for B20 and B100 fuels by KIVA-CHEMKIN coupling

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Abstract

A numerical study is performed by KIVA-CHEMKIN code to compare the combustion, performance and emission characteristics of neat biodiesel (B100) and biodiesel blend including a mixture of 20% biodiesel and 80% diesel (B20) resulting from the PCCI combustion mode in a light-duty diesel engine. For the biodiesel reaction mechanism, multi-chemistry surrogate mechanism using methyl decanoate (MD) and methyl-9-decenoate (MD9D) is used in this study. The results show that PCCI combustion like high temperature conventional combustion cannot cover the lower ISFC of the biodiesel blend fuel compared to the diesel fuel. A detailed analysis of combustion and emissions, involving the role of formaldehyde (CH_2O) and hydroxyl (OH) radicals as well as O and H radicals, was performed in the PCCI combustion stages and emissions formation for the B100 and B20 fuels. The results indicate that higher concentration of formaldehyde as well as lower concentration of hydroxyl radicals for the B20 case advances low temperature heat release (LTHR) and retards high temperature heat release (HTHR) respectively compared to the B100 case. In addition, O and OH radicals as well as cylinder temperature are effective parameters regarding higher NO and CO concentrations for the B20 case compared to the B100 case.

Keywords: PCCI, B100, B20, NOx, Soot, CO.

Nomenclature

A_0	Fluid flow constant	ATDC	After Top Dead Center
D	Diffusion coefficient (m^2/s)	BTDC	Before Top Dead Center

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