Investigating The Performance Of Acetylated Diethyl Ether–Camelina Sativa Biodiesel As Fuel In Compression Ignition Engine

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Abstract

This research aims to test the suitability of a blend of Camelina sativa biodiesel and acetylated diethyl ether as fuel for compression ignition (CI) engines in terms of engine emission, performance, and combustion properties. A Kiloskar TV 1 diesel engine was used to test the fuel samples: Camelina sativa biodiesel (71% v/v) and dimethyl ether blend (29% v/v) (CD), Camelina sativa biodiesel (71% v/v), diethyl ether (20% v/v), and acetylene (9% v/v) (CDA), and conventional diesel. Based on the analyses, the CDA and CD gave higher BTEs of 4.8 and 3.7% than the diesel fuels. The heat release rates (HRRs) were higher than those recorded for the conventional diesel with a longer combustion duration for the blends. Moreover, the CDA fuel gave the lowest CO_2, HC, CO, smoke, and NOx emissions. The resulting peak emissions for the blends are in the following increasing order: unburnt HC (CDA (97) < CD (105) < Diesel (110) < CB (111 g/kWh), NOx (CDA (176) < CD (208) < CB (392) < Diesel (500) g/kWh), and CO (CDA (284) < CD (301) < *C*B (520) < Diesel (541) g/kWh. The remarkable performance of the CDA fuel is due to the synergistic effect of the DEE acetylene in the biodiesel, which culminated in improved heat ratios, engine stability, air excess coefficient (lambda (λ) as well as moderate vibrations and noise.