

Investigation of the Effects of Biodiesel Blend on Particulate-Phase Exhaust Emissions from a Light Duty Diesel Vehicle

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Abstract : This study presents an investigation of diesel vehicle particulate-phase emissions with neat ultralow sulphur diesel (B0, ULSD) and 5% waste cooking oil-based biodiesel blend (B5) in Hong Kong. A Euro VI light duty diesel vehicle was tested under transient (New European Driving Cycle (NEDC)), steady-state and idling on a chassis dynamometer. Chemical analyses including organic carbon (OC), elemental carbon (EC), as well as 30 polycyclic aromatic hydrocarbons (PAHs) and 10 oxygenated PAHs (oxy-PAHs) were conducted. The OC fuel-based emission factors (EFs) for B0 ranged from 2.86 ± 0.33 to 7.19 ± 1.51 mg/kg, and those for B5 ranged from 4.31 ± 0.64 to 15.36 ± 3.77 mg/kg, respectively. The EFs of EC were low for both fuel blends (0.25 mg/kg or below). With B5, the EFs of total PAHs were decreased as compared to B0. Specifically, B5 reduced total PAH emissions by 50.2%, 30.7%, and 15.2% over NEDC, steady-state and idling, respectively. It was found that when B5 was used, PAHs and oxy-PAHs with lower molecular weight (2 to 3 rings) were reduced whereas PAHs/oxy-PAHs with medium or high molecular weight (4 to 7 rings) were increased. Our study suggests the necessity of taking atmospheric and health factors into account for biodiesel application as an alternative motor fuel.

Keywords : biodiesel, OC/EC, PAHs, vehicular emission

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