Composition of Anionic Surfactants and Trace Metal from Diesel and Petrol Exhaust Particulate Matter

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Abstract

Particulate matter from vehicle emissions plays a major role in air pollution, especially in urban areas. The composition of these pollutants may affect the environment and associated health risks. This study investigates the concentration of anionic surfactants and trace metals in exhaust particulate matter from diesel and petrol vehicles to assess their influence on air pollution. Samples of exhaust particulate matter were collected from diesel (bus, lorry, van) and petrol (motorcycle, car) vehicles. Anionic surfactants as Methylene Blue Active Substance (MBAS) were determined by the colorimetric method using a UV-Vis Spectrophotometer, and Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) was used to detect trace metals. Findings showed that diesel vehicle exhaust particulate matter had higher concentrations of anionic surfactants (buses and lorries: 1.04 µmol/g; vans: 0.79 µmol/g) than petrol vehicles (motorcycle: 0.69 µmol/g; car: 0.65 µmol/g). The analysis of trace metals showed notable variations among vehicle types, most likely related to differences in fuel composition, combustion temperature, and lubricant usage. Iron showed the highest concentration observed in bus emissions (296,000 mg/kg), followed by vans (131,000 mg/kg) and motorcycles (8,910 mg/kg). In addition, other metal like zinc, lead, and copper concentrations varied among vehicle types due to factors such as fuel additives, wear on the engine, and combustion conditions. Based on this study, various mitigation procedures can be implemented to reduce the negative impacts of exhaust soot for a better future.

Keywords: Exhaust Particulate Matter; Anionic surfactant; Trace Metal; Diesel Vehicles, Petrol Vehicles.