ABSTRACT

Vehicular tailpipe emissions typically undergoes substantial physical and chemical transformation owing to agglomeration, coagulation, surface condensation, adsorption, and oxidation processes, which tend to modify the original characteristics of the engine exhaust. In this study, parametric investigations were carried out on several two wheeler, three wheeler and four wheeler vehicles operating on diesel, gasoline and CNG at different engine speed, no load condition. A partial flow dilution tunnel was used for sampling and to measure the mass of primary particulates from various vehicles collected on a 47 mm quartz filter paper collected in 30 min duration. This was followed by chemical analysis of the particulates collected on the substrate for Benzene Soluble Organic Fraction (BSOF), which is a marker of toxicology of the exhaust particulates. The particulates collected from vehicular exhaust were analyzed for their elemental composition with a focus on trace metals. BSOF results showed increase in its level with increasing engine speed for all vehicles. The concentration of the metals analyzed showed increasing trend with increasing engine speed for all metals. Real-time measurements for particle bound Polycyclic Aromatic Hydrocarbons (PAHs) were carried out on the diluted primary exhaust coming out of the partial flow dilution tunnel. A peak in PAH concentration was observed at 2500 rpm for various vehicles. In addition, particle number-size, surface area-size and mass-size distributions were also measured in this study. Particle number-size distribution showed an increasing trend with the advancement in engine technology whereas a decreasing trend in particle mass concentration was observed. Gaseous emission, CO, UHC and NO_x showed an increasing trend with increase in engine speed whereas decreasing trend with the advancement in engine technology.