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ASSESSING THE POLLUTION LEVELS OF ATMOSPHERIC AEROSOLS IN THE KANDY CITY WITH HIGH-COST AND LOW-COST AIR SAMPLERS

M.A. ELANGASINGHE AND R. SHANTHINI

Department of Chemical Engineering, Faculty of Engineering, University of Peradeniya

The primary objective of this study is to assess the levels of atmospheric particulate matter in Kandy City using a high-cost, high-volume air sampler, and to correlate these levels with traffic density and atmospheric conditions. The secondary objective is to correlate the pollutant levels measured by the high-volume air sampler to the pollutant levels measured by a low-cost, low-volume air sampler in order to assess the limitations placed in using the low-cost air sampler to measure the air pollutant levels. The high-volume sampler, sampling air at a flow rate of 900-1200 litre/min, is designed to separate the atmospheric particulates into sizes greater than 10 μm and less than 10 μm, and to collect them on two separate filter papers. The particulates of size less than 10 μm are known as PM_{10}, and they could enter the lungs. The low-volume sampler, sampling air at a flow rate of 3 litre/min, collects all the atmospheric particulates entering the sampler only on one filter paper.

Air sampling was carried out at seven sites in and around Kandy, using both the high- and low-volume air samplers, keeping the samplers 5 ft above the ground. At each site, a high-volume sampler and a low-volume sampler were placed in such a manner that the wind blew the road vehicular emissions towards the samplers. Another low-volume sampler was placed away from the high-volume sampler in such a manner that the wind blew the road vehicular emissions away from it. Total sampling time for all samplers was 3 hours per test. Traffic density (vehicles/min), atmospheric temperature, humidity, wind velocity and wind direction were all recorded.

Even though the high-volume sampler recorded 345.3 $\mu g/m^3$ as the highest concentration of PM_{10} and 1124.4 $\mu g/m^3$ as the highest concentration of particulates greater than 10 μm size, both at Katugasthota (near the bridge), no significant correlation was found between these two concentrations measured at all seven sites. It was also found that while the concentration of PM_{10} correlate poorly with the concentration of total particulate matter, the concentrations of particulate matter greater than 10 μm size and total particulate matter very highly correlate with each other (R^2 of 0.98). Correlation studies also showed that PM_{10} concentrations correlate with traffic density with an R^2 of 0.74, while the total particulate matter concentrations correlate with traffic density with an R^2 of 0.55 only. No appreciable correlations were found among the concentrations of particulate matter, PM_{10} or otherwise, and humidity or wind velocity. It was also found in this study that if we keep the low-volume air sampler in such a way that the wind blows vehicular emissions towards the sampler, the colour indices observed with the low-volume air sampler correlates reasonably well with the colour indices observed with the high-volume air sampler ($R^2 = 0.73$). Therefore, it is possible to use the low-cost, low-volume samplers to obtain reliable qualitative information on the level of particulate pollutants present in the atmosphere.

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