E2-01 Comparison of the results of the West and Geake method with those of the automated pulse fluorescent method in the determination of ambient sulfur dioxide

R P Samarakkody, C Abeywickrama, S S B Yalegama
Environmental Div, National Building Research Organisation, Colombo 5

At present, West and Geake spectrophotometric method is mainly used, in the determination of ambient SO_2 among the other standard manual type active sampling methods, due to its greater sensitivity, greater reproducibility, repeatability and adherence to Beer's law throughout a greater working range.

In the West and Geake method the ambient SO_2 is absorbed by a sampling train consisting of 3 25ml fretted type midget impingers each containing 10 ml each of tetrachloromercurate (TCM) absorbing reagent (containing 1.086%(w/v) $HgCl_2$, 0.6% KCl(w/v), 0.0066%(w/v) Na_2-EDTA in distilled water) bubbling at a flow rate of 0.7 l/min, resulting in the formation of dichlorosulfitomercurate. It was observed that the efficiency of absorption depended on the porosity of the fretted part of the impingers and the temperature of the absorbing medium. In this method the absorbed SO_2 is treated with 1 ml 0.6% (w/w)sulfamic acid, 2 ml 0.2%(w/v) HCHO and 5. ml pararosaniline reagent (containing 0.008% (w/w) pararosaniline dye in 1.95%(w/w) H_3PO_4 acid solution) respectively, to form an intensely purple colored pararosaniline methyl sulfonic acid and is measured spectrophotometrically at 548 nm and the concentration read against a calibration plot having a slope of 0.030 ± 0.002 absorbance units per microgram SO_2. This slope represents the purity of pararosaniline dye and the accuracy of the standardization of sulfite solution.

The study showed that the first impinger of the sample train absorbed almost all SO_2 in the air at the flow rate of 0.7 l/min. However, it was also observed that the stability of both parasulfitomercurate which is formed in the absorbing reagent, and the colour of pararosaniline methyl sulfonic acid depends on the environmental conditions such as temperature, intensity of sunlight and other pollutants present in the air. This introduces a considerable error in the case of testing field samples.

This study is the comparison of the results of colorimetric West and Geake method with those of automated Ultraviolet fluorescent spectrophotometry used in the ML 9850 SO_2 analyser which has been designed for the continuous measurement of low concentrations of SO_2 in ambient air. This study was limited to 1 h. sampling and both methods were carried out at the Air Quality Monitoring Station at Fort Railway Station. This Monitoring Station can be considered as a peak station due to vehicular traffic.

The results were compared with a standard gas mixture of SO_2, NO_X, CO, and O_3 with different concentrations of 0.015, 0.03, 0.05 and 0.1 ppm with respect to SO_2 of 0.082 ppm.

The results obtained showed that the ratio of the concentrations between the automated Pulse Fluorescent method and the West & Geake method, for 1 h sampling, was 2.05 ± 0.10 in contrast to 1 in the standard method.