

Abstract

The development and use of passive monitors to determine the atmospheric concentrations of Carbon Monoxide, Nitrogen Dioxide and Ozone in Kingston, Jamaica

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Attempts made to develop a carbon monoxide (CO) passive monitor to measure ambient atmospheric CO levels are described. This is followed by the description of the use of existing passive monitors to determine concentrations of nitrogen dioxide (NO₂) and ozone (O₃) in the Kingston atmosphere.

The usefulness of iodine pentoxide was investigated as an absorber for CO, since it is one of very few substances that react quantitatively with CO at room temperature. Several methods of analysis of the extent of reaction were investigated but the titrimetric determination of the unreacted pentoxide was finally settled on. Results obtained in the glove-box suggest that the method does detect CO levels with reasonable accuracy. However, testing in the field suggests that CO levels are overestimated due mainly to the effect of atmospheric moisture levels in effecting decomposition of the pentoxide. Attempts to reduce this effect by excluding moisture resulted in a monitor that was rather clumsy and difficult to use. It also gave poor precision in duplicate measurements.

The method employing a Y-type zeolite as the absorber was also investigated. The resulting monitors were tested in a CO-charged glove box. The results indicate that humidity again has a significant impact on the monitor's precision and accuracy.

In the second part of this project NO₂ and O₃ were measured at ten sites across the city using passive monitors. The NO₂ results suggest that traffic is the major source of NO₂ at the sites sampled, however the contribution of non-vehicular sources such as electricity generating plants is evident. The variations in O₃ concentration across the city show a clear relationship between its production from primary pollutants emitted by traffic and its transport by diurnal winds to coastal and elevated areas where its mean weekly concentrations are highest.

Overall the results suggest that the National Environmental Planning Agency's (NEPA) annual limit of 100 $\mu\text{g m}^{-3}$ for NO₂ is unlikely to be exceeded at any of the sites. One cannot rule out the possibility however that O₃ concentrations could exceed the hourly standard of 235 $\mu\text{g m}^{-3}$ at some sites. This study presents

the first synoptic view of the NO₂ and O₃ concentrations over the city, and is an example of the usefulness of the information that can be provided by passive monitors.

Keywords: Rashidah Sahar Khan, Carbon Monoxide, Nitrogen Dioxide, Ozone, Passive Monitors, Kingston, Jamaica.