

DETERMINATION OF NO<sub>x</sub> AND SO<sub>2</sub> CONCENTRATION LEVELS IN NAIROBI CITY, KENYA,  
BY USE OF PASSIVE SAMPLERS

John Milikzitek Wamoto

A thesis submitted in partial fulfillment of the requirement for the Degree of Master of Science  
in Chemistry in the Jomo Kenyatta university of Agriculture and Technology

2009

## ABSTRACT

This research work describes the determination of the levels of nitrogen monoxide, nitrogen dioxide (termed as  $\text{NO}_x$ ) and sulphur dioxide ( $\text{SO}_2$ ) in Nairobi city by use of passive sampling method. In this technique, Triethanolamine (TEA) solution and potassium tetrachloromercurate (TCM) solution were used as trapping agents and air samples which were sampled from twelve sites within Nairobi city were analyzed spectrophotometrically. The results obtained by passive sampling method were statistically comparable to those of active sampling method used as reference method. There was a good agreement with coefficient of correlations of 0.9819 NO, 0.9966  $\text{NO}_2$  and 0.9968  $\text{SO}_2$ . The highest 24-hour mean concentrations of  $\text{NO}_x$  and  $\text{SO}_2$  were recorded at City Kabanas site along Nairobi-Mombasa road with  $300.61 \pm 8.21 \mu\text{g}/\text{m}^3$  and  $181.35 \pm 2.46 \mu\text{g}/\text{m}^3$ , respectively and the lowest mean concentrations of  $\text{NO}_x$  and  $\text{SO}_2$  were recorded at Githurai site with  $169.92 \pm 6.12 \mu\text{g}/\text{m}^3$  and  $85.60 \pm 0.78 \mu\text{g}/\text{m}^3$ , respectively. The overall mean levels for these air pollutants were;  $82.87 \pm 6.13 \mu\text{g}/\text{m}^3$  for NO,  $136.78 \pm 9.72 \mu\text{g}/\text{m}^3$  for  $\text{NO}_2$  and  $127.66 \pm 10.45 \mu\text{g}/\text{m}^3$  for  $\text{SO}_2$ . The recorded level of  $\text{NO}_2$  in Nairobi troposphere was found to be above the WHO value of  $100 \mu\text{g}/\text{m}^3$ , that of  $\text{SO}_2$  was within the WHO value of  $125 \mu\text{g}/\text{m}^3$  and that of NO was below the WHO value of  $400 \mu\text{g}/\text{m}^3$ . Furthermore, it was found that levels of  $\text{NO}_x$  and  $\text{SO}_2$  recorded during the dry season were higher than those of the wet season. The trend of levels of  $\text{NO}_x$  and  $\text{SO}_2$  followed the vehicular density and areas with high vehicular traffic and industrial activities had high levels of  $\text{NO}_x$  and  $\text{SO}_2$ . Finally, it was demonstrated that activated charcoal is a good absorbent for NO,  $\text{NO}_2$  and  $\text{SO}_2$  from the atmosphere.