

## Source Identifications and Contributions to Volatile Organic Compounds in Atmosphere of Two Urban Centres of South-western, Nigeria Using Principal Component Analysis

E.G. Olumayede<sup>1\*</sup>, J.M. Okuo<sup>2</sup>, C.C. Ojiodu<sup>3</sup>,

<sup>1</sup>Department of Chemical Sciences, Ondo State University of Science and Technology, Okitipupa, Ondo state, Nigeria; <sup>2</sup>Chemistry Department, University of Benin, Benin City, Edo state, Nigeria; <sup>3</sup>Chemical Science Department, Yaba college of Technology, Lagos, Nigeria

Received November 14, 2012; Accepted May 14, 2013

**Abstract:** In this study, the determination of volatile organic compounds (VOCs) in ambient air was investigated in field studies at several measurement sites of different air quality. Active sampling with the low volume sampling pump (Acuro, Drager, Lubeck, Germany) to draw the air tubes with Chromosorb 106 was used. The average sampling flow rate was  $0.51\text{min}^{-1}$ . The ambient air samples were collected at a height of 1.5 meters at the sampling sites. Samples were collected at 6 days intervals. The sampling periods cover both dry and wet seasons. After sampling, the adsorbed gases were desorbed using solvent extraction method with Carbon disulphide as solvent. The extracted solutions were analyzed with gas chromatography coupled with mass spectrometer. The concentrations of analytes were read from the calibration graph, which was done with standard solution prepared externally at ten calibration levels of concentration range of 0.1 and  $3.50\mu\text{gml}^{-1}$ . The data of ambient VOCs analysis were subjected to statistical analysis; correlation analysis, factor analysis, principal component analysis/absolute principal component scores (PCA/APCS) using SPSS Software package (Version 15). The results obtained reveal that regardless of season there exist significant correlations ( $r^2 > 0.5$ ) among the BTEX species, an indication of importance of other VOCs sources in addition to traffic emission. The factor analysis revealed that three factors contribute to ambient VOCs in both centres. Similarly, PCA/APCS receptor modelling showed that during the dry season, the average contribution to the ambient VOCs ranged between 21 - 52.9% from exhaust emission in the studied area while that of the wet season ranged between 12 - 36.63% for the same locations. High correlation coefficient ( $R^2 > 0.8$ ) between the measured and predicted values suggested that PCA/APCS model was applicable for estimation of sources of VOCs in ambient air.

**Keywords:** Source Identification, Apportionment, Volatile Organic Compounds; Ambient air.

---

\* Correspondence E-mails: [gbengaolumayede@yahoo.com](mailto:gbengaolumayede@yahoo.com); Tel.: +2348034345141