Available online at http://www.journalcra.com

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

International Journal of Current Research
Vol. 5, Issue, 04, pp.843-844, April, 2013

ISSN: 0975-833X

RESEARCH ARTICLE

EVALUATION OF AMBIENT AIR QUALITY OF ABA METROPOLIS, NIGERIA

*,[1]Akuagwu Agwu and Rita N. Ozeh[2]

[1]Department of Chemistry, Abia State Polytechnic, Aba, Abia State, Nigeria
[2]Department of Chemistry, Federal University of Technology, Owerri, Nigeria

ARTICLE INFO

Article History:
Received 27th January, 2012
Received in revised form
26th February, 2013
Accepted 12th March, 2013
Published online 13th April, 2013

Key words:
Ambient air,
Gas analyser,
Criteria pollutants and
Regulatory limits.

ABSTRACT

The quality of ambient air in Aba metropolis, a commercial city in Abia State of Nigeria has been assessed by determining the levels of Total particulate matter (TPM), Carbon (II) Oxide (CO), Nitrogen (IV) Oxide (NO_2), Sulphur (IV) Oxide (SO_2), Hydrogen (II) Sulphide (H_2S), and Methane (CH_4) at ten different sampling points. The analysis was carried out between the months of July and August 2011, and a Crowncom portable gas analyzer was used for each of the determinations. The mean values obtained for CO, NO_2 and H_2S exceeded the standard regulatory limits (EPA and NAAQS) in all the sample points with the exception of the control point. The study showed that there is need for the control and monitoring of ambient air in Aba metropolis by the relevant agencies.

INTRODUCTION

The quality of ambient air is determined by the extent of pollution of the environment. Air pollution is the presence of unwanted materials in the atmosphere that could be harmful to both plants and animals. Air pollutants are classified into two groups: criteria and hazardous air pollutants. The criteria pollutants are commonly found air pollutants that can have adverse effect on health and the environment. They include particulate matter, oxides of Nitrogen, Oxides of Sulphur, Carbon (II) Oxide and Lead (USEPA, 2012). These criteria pollutants are toxic and very injurious to health. Apart from their natural presence in air, they have been introduced into the air by various types of anthropogenic activities such as combustion processes that occur in the engine of vehicles, bush-burning, electricity generating plants, decaying of accumulated organic and domestic wastes, and other industrial processes (Dara, 2000). Air quality has a strong link to human health and wellbeing as has been shown in many epidemiological studies (Zhu, *et al*. 2002_a, Parakash, *et al*., 2006 and Zhu, *et al*., 2002_b). Due to this, the World Health Organization (WHO) has continued to publish and update air quality guidelines of some common air pollutants like Particulate matter (Pm), Ozone (O_3), Hydrogen Sulphide (H_2S), Nitrogen (IV) Oxide (NO_2), Sulphur (IV) Oxide (SO_2) and Carbon (II) Oxide, since 1987 to provide information on monitoring and reducing the health impact of these air pollutants (WHO, 2006).

CO is a criteria pollutant because it is potentially harmful. It is a colourless, odourless and non-irritating poisonous gas which is produced by incomplete combustion processes of natural gas, coal or wood used by vehicles, industrial generators and households for cooking activities. CO displaces oxygen in the blood, forming carboxyhaemoglobin with the human haemoglobin depriving the blood of oxygen and resulting to severe damages of the human cells causing headaches, weakness, dizziness, nausea, coma, respiratory failure and even death in very severe cases (US-DLOSHA, 2002). Road Traffic Workers, Drivers and Workers in metal and petroleum industries are more prone to be affected by CO poisoning (USEPA, 1991). H_2S is extremely toxic. H_2S poisoning can cause paralysis and asphyxiation without warning. It occurs in natural gases, biogas, liquefied petroleum gas, and volcanic gases; and is mostly formed by the anaerobic decomposition of many organic wastes. Methane (CH_4) is a greenhouse gas. It is also released into the atmosphere by biological processes that occur in anaerobic environments, burning of fossil fuel, burning of biomass and decomposition of organic matter in landfills. CH_4 is an asphyxiant and displaces oxygen in an enclosed environment. Particulate matter (pm) is a complex mixture of extremely small particles and liquid droplets of aerodynamic diameter of between 2.5µm to 10µm. Their chemical composition depends on the location, time of year and weather.

They are formed by mechanic disruption (crushing, grinding and abrasion of surfaces) evaporation of sprays; and suspension of dust. The inhalation of particulate matter has been reported to cause adverse health effects such as Asthma, bronchitis, lung cancer, cardiovascular disease, birth defects and premature death. SO_2 and NO_2 has been reported to cause respiratory and cardiovascular diseases in both children and adults (WHO, 2011). They have also been known to cause damage to crops, plants and trees in various ways. In Nigeria, as in most developing countries the baseline data of air quality parameters in most of the cities has not been established. The establishment of air quality data is very important especially in urban areas where vehicular emissions and gaseous emissions from decaying materials, combustion processes and industrial processes are a common phenomenon. Aba, located in Abia State of South Eastern Nigeria is a highly commercialized urban city with large industrial activities and the accompanying high human activities and vehicular movements at all times resulting in emissions that might increase the levels of these pollutants that may ultimately have adverse effects on both animals and plants. This study therefore seeks to determine and establish baseline data on the quality of ambient air in Aba metropolis by obtaining information on the levels of H_2S, CO, NO_2, SO_2, CH_4 and PM in the ambient air of Aba metropolis.

***Corresponding author:** aakenndemics2@yahoo.com

Table of Results showing sample location and Levels of Pollutants*, Standard Deviations and Ranges

Sampling Site	CO	NO_2	SO_2	H_2S	CH_4	PM
OPOPO JUNCTION	39.7 + 10.7	0.072 + 0.006	0.023 ± 0.012	0.067 ± 0.004	0.041 ± 0.023	5.06 ± 1.026
	32 - 51	0.066 – 0.081	0.050 – 0.038	0.058 – 0.070	0.010 – 0.072	3.10 – 5.80
BATA JUNCTION	33.7 ± 12.5	0.058 ± 0.009	0.21 ± 0.005	0.057 ± 0.014	0.042 ± 0.019	5.39 ± 1.124
	14.0 – 49.0	0.050 – 0.070	0.014 – 0.028	0.030 – 0.067	0.010 – 0.063	3.25 – 6.30
MAIN PARK	42.5 ± 2.7	0.071 ± 0.006	0.019 ± 0.005	0.032 ± 0.002	0.049 ± 0.015	5.41 ± 1.34
	38 – 45	0.060 – 0.080	0.015 – 0.029	0.061 – 0.067	0.020 – 0.066	3.20 – 6.60
MILVERTON PARK	38.8 ± 3.3	0.072 ± 0.004	0.016 ± 0.003	0.066 ± 0.002	0.043 ± 0.020	5.11 ± 1.01
	27.0 – 34.0	0.070 – 0.079	0.012 – 0.020	0.063 – 0.070	0.020 – 0.069	3.90 – 6.50
PORTHARCOURT ROAD	36.0 ± 12.6	0.066 ± 0.006	0.025 ± 0.011	0.067 ± 0.003	0.050 ± 0.016	5.26 ± 1.12
	23.0 – 58.0	0.059 – 0.073	0.014 – 0.043	0.61 – 0.071	0.030 – 0.072	3.15 – 6.15
NGWA ROAD JUNCTION	42.2 ± 9.45	0.060 ± 0.003	0.021 ± 0.008	0.66 ± 0.002	0.051 ± 0.025	4.92 ± 0.70
	33.0 – 52.0	0.065 – 0.073	0.010 – 0.034	0.064 – 0.068	0.010 – 0.070	3.95 – 6.10
NEW MAIN MARKET	35.3 ± 10.71	0.067 ± 0.006	0.26 ± 0.010	0.068 ± 0.005	0.047 ± 0.023	5.15 ± 0.93
	19.0 – 49.0	0.060 – 0.072	0.011 – 0.038	0.061 – 0.074	0.010 – 0.068	3.85 – 6.20
AZIKIWE ASA JUNCTION	45.5 ± 10.4	0.074 ± 0.005	0.044 ± 0.021	0.070 ± 0.003	0.050 ± 0.016	5.40 ± 1.38
	24 – 56	0.069 – 0.080	0.013 – 0.072	0.066 – 0.076	0.040 – 0.073	3.15 – 7.10
WATERSIDE JUNCTION	66.8 ± 8.3	0.078 ± 0.002	0.039 ± 0.017	0.078 ± 0.006	0.056 ± 0.023	5.16 ± 1.08
	57.0 – 81.0	0.077 – 0.080	0.014 – 0.055	0.068 – 0.085	0.022 – 0.077	3.15 – 6.20
EMELOGU (CONTROL)	15.3 ± 4.3	0.043 ± 0.017	0.013 ± 0.005	0.034 ± 0.016	0.031 ± 0.019	4.18 ± 0.73
	11.0 – 20.0	0.010 – 0.067	0.005 – 0.019	0.020 – 0.065	0.010 – 0.060	3.00 – 5.20

* = Parameters values and ranges in ppm.

MATERIALS AND METHODS

The study was carried out in ten randomly selected locations in Aba metropolis based on high level of traffic and commercial activities in the area. One location was used as the control. The levels of CO, NO_2, SO_2, CH_4 and total Particulate matter (Pm) were determined in-situ biweekly for a period of three months (June-August, 2011) using a crowcon gasman air analyser/monitor, model CE-89/336/EEC for the different parameters.

RESULTS AND DISCUSSION

The mean and range of values for each of the locations sampled are as shown in the Table 1 below. The data shows that the level of the different parameters in Aba ambient air varies from one location to the other. The level of CO ranged from 11.0 to 81.0ppm for all the sampled stations. The mean values recorded were between 15.3±4.3ppm and 66.8±8.3ppm. The result shows that the highest mean concentration was recorded at Waterside Junction (66.8±8.3ppm) followed by Azikiwe/Asa (45.5±10.4ppm), Main Park (42.5±2.7ppm) and Ngwa Road Junction (42.2±9.5ppm) in decreasing order. This could be attributed to high vehicular volume, traffic congestion and increased human activities during the period of measurement. The burning of old tyres used during the cleaning of hides and skins of animals at the slaughter house located at waterside may be the reason for the very high value of CO recorded for waterside junction in the period of measurement. The high value of CO recorded at this station is higher than the threshold value of CO stipulated by FMENV (FEPA, 1991) and WHO of 15ppm and 10ppm respectively (FEPA,1991and WHO, 2011). The values are also higher than the 30ppm WHO guideline for 1-hour averaging time. The level of CO recorded for all the stations is higher than the recommended guideline values by WHO and FMENV with the exception of the control site which is purely a developing residential area devoid of high traffic density. Similar reports of values higher than the CO recommended limits has been recorded for some other urban cities in Nigeria such as Kano (Ayodele, *et al*. (2007), Lagos (Koku and Osuntogun, (1999)) and Nsukka (Ugwu and Ofomatah, (2011)). These results have been attributed mostly to vehicular emissions and traffic congestion. The NO_2, SO_2 and H_2S values obtained were all slightly higher than the NAAQS, EPA and WHO recommended ranges of value (US EPA, (2012) and WHO, (2006)). The particulate matter and CH_4 values both fell within the recommended limits of all the recognized statutory bodies.

Conclusion

The result of the study gives a baseline data for primary gaseous pollutants in Aba metropolis. The study indicates that the quality of Aba ambient air is in serious threat of pollution of CO, NO_2 and SO_2 if the sources of these criteria pollutants are not monitored and controlled. It is therefore important that the relevant agencies initiate programmes that would help monitor, improve and protect the ambient air quality of Aba metropolis.

REFERENCES

Ayodele, *et al.*, J.T. and A. Adekiya and I. Yakubu (2007). Carbon Monoxide as indoor Pollutant in Kano Metropolis. *J. Appl. Sci. Environ. Management*, 11(3), 27-30.

Dara, *et al.*, S.S. (2000). Textbook of Environmental Chemistry and Pollution Control, S.Chad Co. Ltd, New Delhi.

Federal Environmental Protection Agency (1991). Guidelines and Standards for environmental pollution control in Nigeria; Lagos, Nigeria.

Koku, C.A. and B.A. Osuntogun (1999). Environmental impacts of Road Transportation in South-Western States of Nigeria, *J. Appl. Science*, 7(16); 2536 – 2360.

Parakash, E., W.J Gauderman, and J. Peters (2006). Childhood Asthma and Exposure to Traffic and Nitrogen dioxide, *Epidemiology*, 16 (2), 737 – 743.

Ugwu, K.E. and A.C. Ofomatah (2011). Measurements of Some Ambient Primary Pollutants in Nsukka, Enugu State, Nigeria, *J. Chem. Soc. Nigeria*, 36(2), 76 – 81.

US Department of Labour Occupational Safety and Health Administration (2002). Carbon(II) Oxide poisoning, US Fact sheet, 11(1), 1-2.

USEPA (1991). Air quality criteria- carbon monoxide, US Environmental Protection Agency – Office of Research and Development, Washington DC.

USEPA (2012). Criteria Air Pollutants. http://www.epa.gov/air/ urbanair Retrieved 18/07/12.

WHO (2006). WHO Air Quality guidelines for Particulate Matter, Ozone, Nitrogen (IV) Oxide and Sulphur (IV) Oxide, Global update 2005 – Summary of Risk assessment, WHO Press, Geneva, Switzerland.

WHO (2011). Air quality and health, fact sheet No. 313, WHO Media Centre.

Zhu, A., A. Osterless, M. Drijver, E. Lebret and B. Brunkreef (2002). Chronic Respiratory Symptoms in Children and Adults living along streets with high traffic density, *Occupational Environmental Med*. 53, 241-247.

Zhu, N.A., K.J. Kim, and S. Smorodinsky (2002). Traffic related air pollution near busy roads. The East Bay Children's Respiratory Health Study, *AMJ Respiratory Crit. Care Med.* 170 (5), 520 – 526.

****