Cynthia Nkolika, Int J Petrochem Res. 2017
http://dx.doi.org/10.18689/2638-1974.a1.002

Analysis of exhaust emissions from engines fueled with Gasoline and their blends with biodiesel produced from waste cooking oil

Cynthia Nkolika
University of Nigeria, Nigeria

Analysis of exhaust emissions from engines fueled with gasoline and their blends with biodiesel was carried out. The biodiesel was produced from waste cooking oil via transesterification. Physicochemical analysis of the waste cooking oil and biodiesel were carried out using ASTM methods. The results of the analysis for biodiesel are as follows: moisture content (0.05 %), specific gravity (0.90), acid value (0.22 mg KOH/g), sulphur content (0.01 %), flash point (155^{o}C), kinematic viscosity (1.90 m^2/s), pour point (-3.00^{o}C), ash content (0.09 %), iodine number (13.45 gI_2/100g) and calorific value (34,400 KJ/Kg). Analysis of exhaust emissions (CO, CO_2, O_2 and NOx) from gasoline vehicles as well as big and small generators were carried out using a Bacharach Portable Combustion Analyzer 2. Ten of each of the gasoline vehicles (motorcycles, tricycles, mini-buses and small cars) were analyzed and their average CO, CO_2 and NOx emissions were calculated. Mini-buses emitted the highest concentration of CO (3511.7 ppm) and CO_2 (6.0%) while small cars emitted the highest concentration of NOx (27.1 ppm) and the lowest concentration of CO (2131.9 ppm) and CO_2 (3.5%). However, tricycles emitted the lowest concentration of NOx (3.5ppm). The concentrations of CO from all the petrol vehicles exceeded the 2nd European emission standard (1996) adopted by Nigeria. Ten small and ten large capacity generators were also analysed. Small generators emitted more CO (2876.8 ppm) while the large generators emitted more NOx (30.6 ppm) and CO_2 (6.58%). However, there was no significant difference (P>0.05) between the emissions from large and small capacity generators. Gasoline were blended with biodiesel and used to fuel two generators and one motorcycle at different blend ratios ranging from B5 to B40. At every blend ratio, there was a significant percentage reduction in CO, CO_2 and NOx emitted in the small and large gasoline-biodiesel generators but an increase in NOx in motorcycle with every increase in blend ratio. With the inadherence of the vehicular emissions to an already obsolete adopted Nigerian emission standard, it is expected that the Nigerian environment with about 10 million vehicles and numerous generators will not meet the WHO air quality standard of 9 ppm (CO) and 0.0128ppm (NOx), and therefore would enhance health and environmental hazards associated with exposures to these pollutants.

Biography:

Dr Cynthia Nkolika Ibeto was born on the 10th of August 1982. She graduated with a B Sc. degree (Industrial Chemistry) from University of Ibadan in 2004. In 2007 and 2010 she obtained her M Sc. and PhD (both in Analytical Chemistry) from University of Nigeria Nsukka (UNN). She was an Academic Research Fellow of the National Centre for Energy Research and Development, UNN (September, 2008 to April, 2016) and is currently a Senior lecturer of the Department of Pure and Industrial Chemistry, UNN. Her research area is in the field of Environmental/Analytical Chemistry. She has received a number of Scholarships/awards/travel grants notably Analytical Chemistry Trust Fund, Developing World Scholarship, 2014 and Schlumberger Faculty for the Future Fellowship award, 2015. She is a member of some Professional bodies: Royal Society of Chemistry, Chemical Society of Nigeria, Institute of Chartered Chemists of Nigeria and Organization of Women in Science for developing world.