Asian Journal of Chemistry; Vol. 25, No. 7 (2013), 3773-3780

ASIAN JOURNAL OF CHEMISTRY

www.asianjournalofchemistry.co.in

Characterization of Aromatic Hydrocarbons in Tropical Coastal Water of Sabah, Borneo

KOGILA VANI ANNAMMALA[1,*], MOHD HARUN ABDULLAH[1], MAZLIN BIN MOKHTAR[2], COLLIN G. JOSEPH[3] and MAHYAR SAKARI[1]

[1]Environmental Science Programme, School of Science and Technology, Universiti Malaysia Sabah, Locked Bag 2073, 88999 Kota Kinabalu, Sabah, Malaysia
[2]Institute for Environment and Development (LESTARI), Universiti Kebangsaan Malaysia, Selangor, 43600 UKM Bangi, Selangor, Malaysia
[3]Industrial Chemistry Programme, School of Science and Technology, Universiti Malaysia Sabah. Locked Bag 2073, 88999 Kota Kinabalu, Sabah, Malaysia

*Corresponding author: Fax: +6 088 247 820; Tel: +6 088 320000 ext 5720; E-mail: a.kogilavani@gmail.com

(*Received*: 19 March 2012; *Accepted*: 14 January 2013) AJC-12692

The presence of carcinogenic compounds in the coastal waters was monitored to assess the health effects to human and the marine environment. The details on the level of hydrocarbon contamination in the coastal waters of some small islands and the port in Kota Kinabalu were provided to initiate the management and monitoring plan for ecosystem management and restoration of the target places. This paper reports the occurrences of oil and grease and 16 USEPA listed polyaromatic hydrocarbons in the selected locations of coastal waters of Sabah. A baseline reading on the oil and grease level was established using partition-gravimetric method while detection for polyaromatic hydrocarbons was studied using GC-MS. The level of oil and grease tested were all above the limit set by the Malaysian interim standards (0.04 mg/L), while the level of monitored polyaromatic hydrocarbons were still within an acceptable level. Most polyaromatic hydrocarbons monitored were detected in trace amount and many compounds were found to be below the detection limit of 0.02 µg/mL. The highest concentration of total polyaromatic hydrocarbons detected was 1.16 µg/mL, which was detected in the coastal waters of Manukan Island. Pyrene, benzo (a) anthracene and chrysene were detected in trace amounts in all locations. The levels of monitored carcinogenic hydrocarbon compounds were below the detection limit. Though detected at low levels, the presence of these elements in the coastal water is a cause for concern, hence continuous monitoring is recommended. The cumulative concentration of these compounds in molluscs and fish should be initiated to determine the accumulated level and the xenobiotic effect to humans and marine fauna. The main contributor of these pollutants was identified to originate from boating and shipping related activity in the vicinity of these area.

Key Words: Oil and Grease, Polyaromatic hydrocarbons.

INTRODUCTION

Coastal environment is a vast sparsely populated wilderness. These environments are susceptible to man-induced stresses, such as pollution and climate changes. Prodigious amount of crude oil are extracted from earth every year and moved across the oceans and approximately 0.1 % of the total oil extracted ends up in the marine systems each year, with accidental spills having the most spectacular impact. Petroleum hydrocarbons also enter the coastal marine environment as exhaust particulates, fuel spills, urban runoffs contaminated with crankcase oil and the by-products of biomass combustion[1,2]. Low molecular weight hydrocarbons tend to be more concentrated in the vapour-phase while the ones with higher molecular weight are often associated with particulates[3,4].

There are more than 600 different types of hydrocarbons reported from petroleum products in which aromatics are the second largest group[5,6]. Polycyclic aromatic hydrocarbons (PAHs) are mainly concerned pollutants in the environment due to their toxic, mutagenic and carcinogenic properties[7-9]. United states environmental protection agency (USEPA) listed 16 of polycyclic aromatic hydrocarbons as priority pollutant compounds for human and the environment[10-12]. This paper examines the environmental protection agency lists of the 16 polycyclic aromatic hydrocarbons hazardous compounds, which are further divided into carcinogenic and non-carcinogenic polycyclic aromatic hydrocarbons. The two and three ring polycyclic aromatic hydrocarbons are non-carcinogenic, while several four, five and six membered rings of polycyclic aromatic hydrocarbons are carcinogenic. The four membered ring polycyclic aromatic hydrocarbons are chrysene and benzo (a) anthracene. The five membered ring polycyclic aromatic hydrocarbons are benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and dibenzo(a,h)anthracene. Six mem-