MAJOR SOURCES AND DISTRIBUTION OF POLYCYCLIC AROMATIC HYDROCARBONS IN SEDIMENT OF RIVERS AND ESTUARIES IN EAST MALAYSIA

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Introduction

Most studies of polycyclic aromatic hydrocarbons (PAHs) distribution in rivers and coastal estuarine sediments have been conducted in the more industrialized areas of the world such as the United States, Canada, Europe, Australia, and Japan. In the south East Asia, industrialization has proceeded fast during the past decade and the potential associated in PAHs input is concerned. The polycyclic aromatic hydrocarbons (PAHS) are pollutants of concern due to their persistent in the marine ecosystem, thus its can cause long-term adverse effect to the marine life. Therefore, the importance of studding PAHs in coastal sediments also relates to their bioaccumulation in selfish and other benthic organisms, and possible entry to human food chains by this route. In recent years, increasing attention has been paid to the environmental behavior of PAHs in estuarine systems, as these areas act as transit zones in which contaminations are transported from rivers to oceans.

Problem statement

In recent years, Malaysia`s pollution, as well as its concomitant urban and industrial development has expanded rapidly (Zakaria et al.,Boonyatumanond et al.,2006) .Due to the rapid expansion of the urbanization and population of the Miri city, Sarawak, East Malaysia and also Bintulu which is a major industrial centre. Malaysian coasts are subjected to various threats of petroleum pollution including routine and accidental oil spill from tankers, spillage of crude oils from inland and offshore oil fields, and run-off from land-based human activities. These two Miri and Bintulu rivers located at the west coast of Sarawak face the South China Sea. Therefore; they are vulnerable to oil pollution because of intense petroleum production activities in the area and also urbanization and industrialization, which together cause water pollution.

Significant of study

According to the high amount of people living around these two areas, if the contaminants widespread through the area, they can threat those people health. In addition, their distribution also causes endanger the strategic location of the area.

Study Objectives

1) To investigate the contamination level and distribution of sedimentary PAHs in rivers and estuaries of East Malaysia

2) To investigate the major sources of PAHs in rivers and estuaries of East Malaysia. It is expected that the result can provide a basis of comparison for future works to elucidate temporal changes in pollution levels.

Literature review

Polycyclic aromatic Hydrocarbon (PAHs)

The terms `polycyclic aromatic hydrocarbons ` is commonly refers to a large range of organic compounds containing two or more fused aromatic rings made up of carbon and hydrogen(Neff , 1979).

The discovery of the East Coast of peninsular Malaysia during the 1950s has enriched its economy. Since then, oil pollution has persistently affected the marine environment in Malaysia (Law and Hii, Zakaria et al., 2000).

During the 1950s, oil pollution has persistently affected the marine environment in Malaysia(Zakaria et al., 2000).

Since the 1990s many studies have been conducted to investigate PAHs contaminations in estuaries on a global scale (Mai et al., 2001).

Zakaria et al. (2002) demonstrate the widespread input of petrogenic PAHs to Malaysian water.

In the past investigations have concentrated mostly on PAH

Concentrations in rivers of the Daliao River Watershed (Guo et al., 2007).

The source and distribution of PAHs have been the focus of numerous investigations for water (; Shi et al., 2007)

Chandru et al. (2008) in their study of characterization of hopane in tar balls collected from the East Coast of Peninsular Malaysia suggest that the major source of tar-ball pollution in the Straits of Malacca was from waste water from oil tankers from the Middle East; however the tar-balls from the East Coast of Peninsular Malaysia are most likely derived from the offshore oil platforms in the South China Sea.

Mahua et al. (2009) in their study of Sources of sedimentary PAHs in tropical Asian Waters focus on the difference in the thermodynamic stability among PAHs species to distinguish pyrogenic and petrogenic PAHs.

Methods

Some specified sampling will be selected along the East Rivers and estuaries of Malaysia. Sediments samples are collected by using the van veen garb and samples are transfer into the glass bottle with aluminum cap using the stainless steel spatula. Samples are stored below 5c before analysis. Sediment samples will be dried by using anhydrous sodium for removing water.1 gram of dried sediment is weighted then put into a glass-fibber thimble and added soxhlet extracted using 150 ml of DCM with cycling rate of 10min/cycle for about two hours. The extracts are re-dissolved into 1 ml of DCM/hexane (3:1, vol/vol) and pipette to the top of 5% H2O deactivated silica column (1 cm i.d x 9 cm length). Hydrocarbon ranging from n-alkanes to PAHs with 7 rings eluted with 20 ml of DCM/hexane (1:3 vol/vol). The solution is then reduced in volume at around 5 ml and approximately 5g activated copper is added and allows a night to elemental sulphur reaction. The solution passing funnel plugged with quartz wool, which trap the copper and copper sulfide on it. The filtrate is dried by using rotary evaporator and is dissolved into 0.4 ml of n- hexane and transferred to the top of fully activated silica gel column (0.47 cm i.d x 18 cm length). The hexane fraction is rotoevaporated to 0.5 ml and transferred into a 1.5 ml glass ampoule. Then, this study will use Gas chromatography-mass spectrometry (GC-MS) for analyzing PAHs. Helium gas will be used as a carrier gas.