Polynuclear Aromatic Hydrocarbon (PAHs) in the Thai/Laos Mekong River, 2000-2003

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Abstract

Seasonal monitoring of 10 sampling stations along Thai/Laos Mekong River both water and sediment samples from Golden triangle, Chiang Rai to Kongchiam, Ubon Ratchathani were analysed. Qualitative and quantitative analysis of the 16 priority PAHs namely, naphthalene, acenaphthylene, fluorene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene and indeno(1,2,3-cd)pyrene were determined by EPA 8310 method using HPLC-DAD. Total PAHs were measured by fluorescence chrysene equivalents. The results show that the total amount of PAHs in the surface water and sediments were in the range of 1.1-2.8 ppb and 25-280 ppb respectively.

Introduction

PAHs are ubiquitous pollutants in environment, consisting of two or more fused benzene rings in linear, angular or cluster arrangement. PAHs in the atmosphere can be polluted in many kinds of environmental sample such as soil, rain, river etc., which many are known to be carcinogenic agents. The toxicity of the PAHs in environment depends on the types and quantity of each PAHs. The aim of this report is to examine the spatial distribution and seasonal variation of the PAHs in the Mekong River, Thailand from 2000-2003.

Analysis of PAHs by HPLC

Sediment: The extraction method was the same as the analysis by spectrophotofluorometer. The extract was evaporated to dryness in a rotary evaporator at 40-50°C and the residue was transferred quantitatively into a volumetric flask using acetone. Analysis of 16 PAHs in the extracts were performed by HPLC-DAD (EPA 8310) using the standard addition method.

Water: The extraction method was the same as the analysis by spectrophotofluorometer. The extract was analyzed for 16 PAHs using the same procedure as described in the previous section.

Analysis of combustible material in sediment

Combustible material was determined by the loss of weight incurred when a sample of sediment was heated to 900°C and maintained at this temperature for 1 hour.

Results and Discussion

Water: The total PAHs concentrations (µg chrysene equivalent per gram dry weight) in the sediments shown in Figure 5-7 show some sediments containing more than 0.5 µg/g of PAHs that are attributed (Yilmaz et al., 1998). The concentration appeared to be seasonal variation associated mainly with the rains and the temperature.

Figure 2 Total PAHs concentration in surface water (µg/L)

Figure 3 Seasonal variation of PAHs in water from different stations along the Mekong River (mg/kg)

Figure 4 Average PAHs of all seasons in water from different stations along the Mekong River (mg/kg)

Conclusions

This work shows the distribution of PAHs in water and sediments at various locations and seasons. It seems that there is a seasonal variation associated with rains and temperature. The results show that the total amount of PAHs in the surface water and sediment were in the range of 1.1-2.8 ppb and 25-280 ppb respectively. Although the bald percentage is low but it does not take into account the bioaccumulation factor which range from 69-29000 for the PAHs analyzed.