OCCURENCE AND DISTRIBUTION OF POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) IN THE SOILS OF THE URBAN AREA IN KOTA BHARU

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Occurence and distribution of polycyclic aromatic hydrocarbons (PAHs) in the soils of the urban area in Kota Bharu / Wan Mohd Khairul Wan Mohamed Zin.

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By

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Thesis submitted in partial fulfillment of the requirement for the Degree of Science (Hons.) Chemistry.

Faculty of Science and Technology
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To Mek and Wae for bringing me into this world
and for giving their entire love to me.

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WAN MOHD KHAIRUL BIN WAN MOHAMED ZIN

Approved by:

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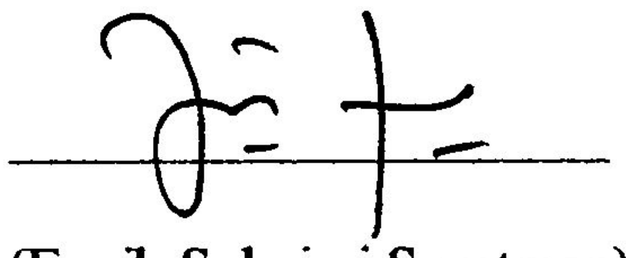
Date : 31.3.2002

(Associate Professor Dr. Norhayati Binti Mohd Tahir)

Coordinator



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" To accomplish big things, I am convinced must first dream big dreams"

... ... Conrad Hilton

ABSTRACT

Polycyclic Aromatic Hydrocarbons (PAHs) is ubiquitos in our environment and is more likely to be carcinogenic if compared to other major pollutants. PAHs which is antropogenically produced is normally derived from the incomplete combustion of fossil fuels from vehicular engines as well as from incomplete combustion of organic matter. A great concern of the public about the effect of PAHs had made many studies were undertaken previously in the soils around the world. The present study was carried out to determine the distribution and concentration of PAHs in the town of Kota Bharu. A total 20 sampling sites were choosen covering the town center and surrounding area as well as suburbs of Kota Bharu. In addition, one site located near an industrial estate was also choosen for comparison. PAHs were extracted from the soil matrix using Ultrasonic Agitation method with Dicholoromethane (DCM) as extraction solvent. Fractionation of hydrocarbons was carried out using silica-alumina column and the characterization of individual PAHs found in the soil samples were done using GCMS. Concentration of total identified PAHs found in this study falls in the range of 0.0222 μg/g to 24.0551 μg/g. Station 12 which is in Zone C, exhibit the highest concentration of total identified PAHs found in the study, that is 24.0551 μg/g . While stations 10 and 17 showed the lowest concentration of total identified PAHs in the study, which is 0.0222 μg/g respectively. All stations exhibit the presence of BaP, which indicate that the major contributor of PAHs in Kota Bharu is derived from incomplete combustion of organic matter. Correlation test showed that there is a significant difference ($P < 0.05$) between the PAHs concentration with organic carbon. While, most stations also exhibit the

presence of BgP. The strong relationship between BgP and total identified PAHs shows that, the major contributor of PAHs composition in the urban area of Kota Bharu is a mixed petrogenic pyrolitic sources (i.e gasoline and diesel vehicles emissions), followed by the incomplete combustion of organic matter which is result in the abundance of BaP detected in this study and also strong relationship between BaP and total identified PAHs.

ABSTRAK

Polisiklik Aromatik Hidrokarbon (PAH) adalah banyak dijumpai di dalam alam sekitar dan seakan–akan lebih karsinogenik berbanding dengan bahan pencemar yang lain. PAH yang mana dihasilkan secara antropogenik adalah biasanya berasal daripada pembakaran tidak lengkap bahan api fosil daripada enjin kenderaan begitu juga hasil daripada pembakaran tidak lengkap jirim organik. Perhatian umum terhadap kesan PAH telah menyebabkan banyak kajian telah dijalankan terdahulu pada tanah-tanah di seluruh dunia. Kajian ini dijalankan untuk menentukan taburan dan kepekatan PAH di bandar Kota Bharu. Sejumlah 20 tapak pensampelan telah dipilih meliputi pusat bandar dan kawasan sekeliling, begitu juga di kawasan pinggir bandar Kota Bharu. Sebagai tambahannya, satu tapak telah dipilih yang berdekatan dengan kawasan perindustrian sebagai perbandingan. PAH diekstrak daripada matrik tanah melalui kaedah Getaran Ultrasonik menggunakan Diklorometana sebagai pelarut pengekstrak. Pemisahan hidrokarbon dalam ekstrak pula dijalankan melalui kaedah turus kromatografi silika-alumina dan pencirian PAH individu yang dijumpai dalam sampel tanah dijalankan dengan menggunakan KGSJ. Kepekatan PAH yang diperolehi melalui kajian ini adalah dalam julat 0.0222 μg/g hingga 24.0551 μg/g. Stesen 12, yang terletak dalam Zon C telah menunjukkan jumlah PAH yang dikenalpasti yang tertinggi dalam kajian ini iaitu 24.0551 μg/g. Manakala stesen 10 dan 17 menunjukkan jumlah yang terendah iaitu masing-masing 0.0222 μg/g. Semua stesen menunjukkan kehadiran BaP yang mana menunjukkan bahawa penyumbang utama PAH di Bandar Kota Bharu adalah hasil dari pembakaran tidak lengkap jirim organik. Ujian kolerasi menunjukkan terdapatnya

perbezaan bererti ($P < 0.05$) di antara kepekatan PAH dan karbon organik. Manakala, kebanyakan stesen menunjukkan kehadiran BgP. Hubungan yang kuat antara BgP dengan jumlah PAH yang dikenalpasti menunjukkan bahawa penyumbang utama kandungan PAH di kawasan bandar Kota Bharu adalah daripada percampuran sumber pirolitik petrogenik (spt. gasolin adan pencaran kenderaan diesel), diikuti oleh pembakaran tidak lengkap jirim organik di mana ditunjukkan dengan kehadiran BaP dengan banyaknya dalam kajian ini serta hubungan yang kuat antara BaP dengan jumlah PAH yang dikenalpasti.