Analysis and characterization of polyclycyclic aromatic hydrokarbons in selected school areasof Kuala Terengganu / Chong Khoon Hoong.

Lihat sebelah

ANALYSIS AND CHARACTERIZATION OF POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) IN SELECTED SCHOOL AREAS OF KUALA TERENGGANU

By

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Research Report submitted in partial fulfillment of
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PENGAKUAN DAN PENGESAHAN LAPORAN PROJEK PENYELIDIKAN I DAN II

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ANALYSIS AND CHARACTERIZATION OF POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) IN SELECTED SCHOOL AREAS OF KUALA TERENGGANU oleh Chong Khoon Hoong, No. Matrik UK 6941 telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Kejuruteraan sebagai memenuhi sebahagian daripada keperluan memperolehi Ijazah Sarjana Muda Teknologi (Alam Sekitar), Fakulti Sains dan Teknologi, Kolej Universiti Sains dan Teknologi Malaysia.

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LIST OF ABBREVIATIONS / SYMBOLS

Abbreviations	Description
PAHs	Polycyclic aromatic hydrocarbons
HVAS	High volume air sampler
GC-FID	Gas chromatography – flame ionization detector
API	Air pollution index
DOE	Department of Environment
POPs	Persistent organic pollutants
WHO	World Health Organization
EI	Electron impact
IARC	International Agency for Research on Cancer
EPA	Environmental Protection Agency
Ace	Acenaphthylene
Ant	Anthracene
BaA	Benz(a)anthracene
BaP	Benzo(a)pyrene
BbF	Benzo(b)fluoranthene
BbK	Benzo(k)fluoranthene
Bpe	Benzo(g, h, i)perylene
Chr	Chrysene

Abbreviations	Description
DbA	Dibenz(a, h)anthracene
Fth	Fluoranthene
FI	Fluorene
IP	Ideno(1, 2, 3-c, d)pyrene
Na	Naphthalene
Phe	Phenanthrene
Pyr	Pyrene
K_{ow}	Hydrophobicity index
DNA	Deoxyribonucleic acid
v/ v	volume per volume
%	percent
CC	column chromatography
PAC	polycyclic aromatic compounds

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ABSTRACT

Road vehicle is one of the most important sources of PAHs in urban air, along with residential heating systems and various industrial activities involving combustion. Consequently, it will bring to a health problem to human being due to the occurrence of carcinogenic compounds known as polycyclic aromatic hydrocarbons (PAHs). However, the concern and awareness of the sources and effects of PAHs on human health are still very low among the people in Malaysia especially in Kuala Terengganu. Therefore, the purposes of this study are mainly concerned on the analysis and characterization of polycyclic aromatic hydrocarbons (PAHs) in atmospheric particles and roadside soil particles at four selected sampling station (school areas) in Kuala Terengganu, Malaysia. Airborne particles will be sampled by using High Volume Air Sampler (HVAS) fitted with glass fiber filters for 8 hours period of sampling. The samples were extracted with dichloromethane by ultrasonic agitation. Later, the extracts were concentrated on rotary evaporator for dry out before fractionated on an alumina-silica column. Finally, quantification and identification of individual PAHs compound were performed on gas chromatography-flame ionization detector (GC-FID) by comparing their retention times with those known standards. Total PAHs concentrations in the atmospheric particles and roadside soil particles were found to be 52194.007 μg/g and 9.334 μg/g respectively. The highest concentration of PAHs obtained for atmospheric particles is in S3 sampling station with a value of 39603.50 μg/g compared to other sampling station. Meanwhile, the highest concentration of PAHs obtained for roadside soil particles is in S2 sampling station with a value of 3.897 μg/g compared to other sampling station. Naphthalene was found to be the majority dominant and abundant compound detected in both atmospheric and roadside soil particles. The highest concentration of naphthalene obtained for atmospheric particles is 21981.50 μg/g from S3 sampling station. Meanwhile, the highest concentration of naphthalene obtained for roadside soil particles is 2.291 μg/g from S2 sampling station.

ABSTRAK

Kenderaan bermotor merupakan salah satu sumber terpenting PAHs dalam persekitaran bandar bersama-sama dengan sistem pemanasan perumahan dan berbagai aktiviti industri yang melibatkan pembakaran. Sebagai akibatnya, ia membawa kepada masalah kesihatan terutama kepada manusia disebabkan kemunculan komponen karsinogen yang dikenali sebagai polisiklik aromatik hidrokarbon (PAHs). Walau bagaimanapun, keprihatinan dan kesedaran tentang sumber dan kesan yang dibawa oleh PAHs ini kepada kesihatan manusia masih kurang di kalangan penduduk Malaysia terutamanya di Kuala Terengganu. Untuk itu, tujuan utama kajian yang dijalankan adalah fokus kepada analisis dan pencirian polisiklik aromatik hidrokarbon (PAHs) dalam partikel udara dan tanah di empat lokasi persampelan (kawasan sekolah) yang dipilih di sekitar Kuala Terengganu. Zarah terampai udara disampel dengan pensampel isipadu tinggi (HVAS) yang dilengkapi dengan turasan kaca berfiber. Kemudian, turasan diekstrak dengan menggunakan ultrasonic asutan. Selepas diekstrak, ia dikonsentrasikan dengan penyejatan berputar untuk pengeringan sebelum dipecahkan menjadi pecahan dengan menggunakan kolum kromatografi. Akhirnya, analisis untuk paras kepekatan jumlah zarahan polisiklik aromatik hidrokarbon (PAHs) dijalankan dengan kromatografi udara-pengesan pengionan api (GC-FID) berbanding masa tahanan dengan piawai yang diketahui. Jumlah kepekatan PAHs yang diperolehi dalam ampaian udara dan zarahan tanah adalah 52194.007 μg/g and 9.334 μg/g masing-masing. Jumlah kepekatan PAHs yang tertinggi diperolehi bagi ampaian udara adalah di lokasi persampelan S3 dengan nilai 39603.50 μg/g berbanding lokasi persampelan yang lain. Manakala, jumlah kepekatan PAHs yang tertinggi diperolehi bagi zarahan tanah adalah di lokasi persampelan S2 dengan nilai 3.897 μg/g berbanding lokasi persampelan yang lain. Naftalena didapati merupakan kompoun yang paling menonjol dan kerap muncul dalam kedua-dua partikel udara dan tanah. Jumlah kepekatan tertinggi naftalena yang diperolehi bagi ampaian udara adalah 21981.50 μg/g dari lokasi persampelan S3. Manakala, jumlah kepekatan tertinggi naftalena yang diperolehi bagi zarahan tanah adalah 2.291 μg/g dari lokasi persampelan S2.