CONCENTRATION AND DISTRIBUTION OF LINEAR ALKYLBENZENE IN SEDIMENTS OF SELECTED MALAYSIAN RIVERS AS MOLECULAR MARKERS OF SEWAGE TREATMENT EFFICIENCY
CONCENTRATION AND DISTRIBUTION OF LINEAR ALKYL BENZENE IN SEDIMENTS OF SELECTED MALAYSIAN RIVERS AS MOLECULAR MARKERS OF SEWAGE TREATMENT EFFICIENCY

By

SAMI MUHSEN SLEMAN MAGAM

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfillment of the Requirement for the Degree of Master of Science in the Faculty of Environmental Studies

March 2012
DEDICATION

To my dear wife, close friends, my family, and my supervisor who have been the most important reasons of hopefulness during my study.
Abstract of thesis presented to the senate of Universiti Putra Malaysia in fulfillment of the requirement of the degree of Master of Science

CONCENTRATION AND DISTRIBUTION OF LINEAR ALKYLBNZENE IN SEDIMENTS OF SELECTED MALAYSIAN RIVERS AS MOLECULAR MARKERS OF SEWAGE TREATMENT EFFICIENCY

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Chairman : Associate Professor Mohamad Pauzi Zakaria, PhD
Faculty : Environmental Studies

The present study investigates the distribution of linear alkylbenzenes (LABs) in sediment samples collected from selected locations in Sarawak, Sembulan, and Kuantan rivers in Peninsular Malaysia. Batch studies were conducted to assess the current status of domestic wastes and synthetic detergent pollution in sediments in these three rivers. Twenty-three sampling stations have been selected for sediment collection. Analysis and quantification of LABs was carried out using gas chromatography-mass spectrometry (GC-MS). Concentrations of total LABs in ng/g on a dry weight basis (dw) in the sediment samples of Sarawak River, Sembulan River, and Kuantan River ranged from 156.5 to 7386.2; 643.2 to 5567.1; and 772.8 to 7517.6 ng/g dw, respectively. The \( I/E \) ratio (ratio of internal to external isomers of LABs) is employed to estimate the degree of degradation of LABs in aquatic environments, making it a powerful, though simple, tool for monitoring biodegradation of LABs in the environment. The \( I/E \) ratios for Sarawak, Sembulan, and Kuantan rivers fell in the ranges 0.52 to 1.24; 0.81 to 1.79; and 0.50 to 1.28, respectively. The \( I/E \) ratio at station two in Kuantan River was much lower than those
at the other stations, indicating that the sewage discharged into Kuantan River was poorly treated.

Anthropogenic activities may contribute to high levels of LABs in sediment samples. In addition to anthropogenic activities, natural features of the sampling location may contribute significant amounts of LAB discharges to the aquatic systems. In sum, the study results demonstrate that the LABs are useful as indicators of pollutants originating from domestic wastes and synthetic detergents.
Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

KEPEKATAN DAN PENGAGIHAN LINEAR ALKYL BENZENE DALAM ENAPAN SUNGAI TERPILIH MALAYSIA SEBAGAI PENANDA MOLEKUL KECEKAPAN PENGOLAHAN KUMBAHAN

Oleh

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Pengerusi : Profesor Madya Mohamad Pauzi Zakaria, PhD
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Kajian ini dijalankan bagi meniasat taburan linear alkil benzen (LAB) di dalam sampel sedimen yang diambil dari beberapa lokasi terpilih di sungai Sarawak, Sembulan dan Kuantan di Semenanjung Malaysia. Kajian sacara berkelompok telah dijalankan untuk menilai status terkini bagi pencemaran detergen sintetik dan sisa domestic di dalam sedimen dari tiga sungai tersebut. Dua puluh tiga stesen telah dipilih untuk penyampelan sedimen. Analisis dan kuantifikasi LAB telah dijalankan dengan menggunakan Kromatografi gas-spektometri jisim (GC-MS). Kepekatan jumlah LAB dalam unit ng/g berasaskan berat kering (dw) di dalam sampel sedimen sungai Sarawak, sungai Sembulan dan sungai Kuantan berjulat dari 156.5 hingga 7386.2; 643.2 hingga 5567.1; dan 772.8 hingga 7517.6 ng/g dw. Nisbah I/E (nisbah isomer LAB dalaman kepada luaran) diaplikasikan untuk menganggarkan darjah degradasi LAB di persekitaran akuatik, menjadikan ia suatu alat yang mudah lagi berkesan dalam pengawasan biodegradasi LAB di dalam alam sekitar. Nisbah I/E
bagi sungai Sarawak, Sembulan dan Kuantan berjulat dari 0.52 hingga 1.24; 0.81 hingga 1.79; dan 0.50 hingga 1.28. Nisbah I/E di stesen dua di sungai Kuantan adalah sangat rendah dari stesen lain, menunjukkan bahawa pembuangan sisa kumbahan ke dalam sungai Kuantan adalah tidak dirawat dengan sempurna. Aktiviti antropogenik mungkin menyumbang kepada tahap kepekatan LAB yang tinggi di dalam sampel sedimen. Merujuk kepada aktiviti antropogenik, ciri-ciri semulajadi yang terdapat di stesen penyampelan mungkin telah menyumbang amaun LAB yang siknifikan di dalam sistem akuatik. Kesimpulannya, hasil kajian menunjukkan bahawa LAB adalah berkesan sebagai penunjuk aras bagi bahan pencemar yang berasal dari sisa domestik dan detergen sintetik.
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APPROVAL

I certify that a Thesis Examination Committee has met on 1st April 2012 to conduct the final examination of Sami Muhsen Sleman Magam on his thesis entitled “Concentration And Distribution Of Linear Alkylbenzene In Sediments Of Selected Malaysian Rivers as Molecular Markers of Sewage Treatment Efficiency” in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The committee recommends that the student be awarded the Master of Science.

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DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.

_________________________
SAMI MUHSEN SLEMAN MAGAM

Date:
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEDICATION</td>
<td>i</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>ii</td>
</tr>
<tr>
<td>ABSTRAK</td>
<td>iv</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>vi</td>
</tr>
<tr>
<td>APPROVAL</td>
<td>viii</td>
</tr>
<tr>
<td>DECLARATION</td>
<td>x</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xiv</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xvi</td>
</tr>
<tr>
<td>LIST OF ABBREVIATIONS</td>
<td>xix</td>
</tr>
</tbody>
</table>

## CHAPTER

### 1 INTRODUCTION
1.1 Background of Study
1.2 Problem Statement
1.3 Significance of Study
1.4 The Objectives of the Study

### 2 LITERATURE REVIEW
2.1 The Concept of Molecular Markers Analysis
  2.1.1 Biogenic Marker
  2.1.2 Fossil biomarker
  2.1.3 Anthropogenic Molecular Markers
2.2 Linear Alkylbenzenes (LABs)
2.3 Nomenclature
2.4 Production of LABs
2.5 Physicochemical Properties of LABs
  2.5.1 Physical and Chemical Properties
  2.5.2 Aqueous Solubility and Log Octanol-Water Partitioning Coefficient
  2.5.3 Forms and Persistence
  2.5.4 Biodegradability of Detergent Products
2.6 Sources of LABs
  2.6.1 Incomplete Sulfonation of LABs
  2.6.2 Fluid Drilling
2.7 Transport and Distribution of LABs
  2.7.1 Distribution of LABs in Sediments
  2.7.2 Distribution of LABs in Sewage
  2.7.3 Distribution of LABs in Water
2.8 Toxic of LABs
2.9 Biodegradation of LABs
2.10 Ratios of Internal to External LAB Isomers (I/E Ratio)
2.11 Effectiveness of Sewage Treatment Plants
2.12 Gas Chromatography-Mass Spectrometry (GC-MS)
3 METHODOLOGY

3.1 Sampling Locations and Sample Collection 36
3.2 Sediment Sample Collection 40
3.3 Chemicals and Materials 41
   3.3.1 Surrogate Internal Standard (SIS), Internal Injection Standard (IIS) and Native Standard Mixture of LABs 41
   3.3.2 Organic Solvents 44
   3.3.3 Preparation of 5% Deactivated Silica Gel 44
   3.3.4 Anhydrous Sodium Sulphate (Na$_2$SO$_4$) 45
3.4 Cleaning of Glassware and Apparatus 45
3.5 Analytical Procedure 46
   3.5.1 Extraction and Fractionation 46
      3.5.1.1 Activated Copper Treatment 46
      3.5.1.2 Vacuum Rotary Evaporation 47
   3.5.2 Purification - First Step Silica Gel Column Chromatography 47
   3.5.3 Fractionation - Second Step Silica Gel Column Chromatography 48
   3.5.4 Nitrogen Blow-down 49
   3.5.5 Preparation for GC-MS 49
   3.5.6 Gas Chromatography-Mass Spectrometry (GC-MS) Analysis 51
3.6 Identification of Sample Peaks 55
3.7 Calibration Curves and Linearity of the Response Factor 56
3.8 Quality Control and Quality Assurance 57
3.9 LAB Concentration in the Samples 59
3.10 Analysis of Variance (ANOVA) for the LAB Concentrations in the Three Rivers 60

4 RESULTS AND DISCUSSION 63
4.1 Levels of LABs in the Sediments of the Studied Rivers 63
   4.1.1 The Concentrations of LABs in Sediments of Sarawak River 64
   4.1.2 The Concentrations of LABs in Sediments of Sembulan River 68
   4.1.3 The Concentrations of LABs in Sediments of Kuantan River 71
4.2 Biodegradation of LABs and the Internal to External LAB Congener Ratios (I/E) in the Three Rivers 74
   4.2.1 Biodegradation of LABs and the I/E Ratios for Sarawak River 75
   4.2.2 Biodegradation of LABs and the I/E Ratios for Sembulan River 78
   4.2.3 Biodegradation of LABs and the I/E Ratios for Kuantan River 80
   4.2.4 Comparison of Total LABs Concentrations in Sediments from Different Countries 83
   4.2.5 Comparison of I/E Ratios in Sediments from Different Countries 83
4.3 Spatial Distribution of LABs in the Three Rivers 84
4.4 Statistical Analysis 87
  4.4.1 Analysis of Variance (ANOVA) for the LAB 88
    Concentrations in the Three Rivers
  4.4.2 Cluster Analysis 91

5 CONCLUSION AND RECOMMENDATIONS FOR FUTURE RESEARCH 95

REFERENCES 99
APPENDICES 105
BIODATA OF STUDENT 125
LIST OF PUBLICATIONS 126