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SOURCE APPORTIONMENT OF VOLATILE ORGANIC COMPOUNDS IN BANGKOK AMBIENT AIR

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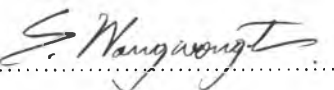
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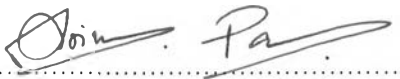
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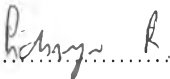
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พรรณวดี สุวัณณิกะ : การระบุสัดส่วนแหล่งที่มาของสารอินทรีย์ระเหยได้ในบรรยากาศ
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สารอินทรีย์ระเหยได้มีการระบายออกจากแหล่งกำเนิดต่างๆ มากมายหลายแหล่ง ทั้งจาก
กิจกรรมของมนุษย์ และจากธรรมชาติ สารอินทรีย์ระเหยได้เป็นสารตั้งต้นที่สำคัญในปฏิกิริยาโฟโต
เคมีคัล ทำให้เกิดมลพิษโอโซนที่ระดับพื้นโลก เกิดการรวมตัวเป็นละอองไอทุติยภูมิ ซึ่งเป็นอันตรายต่อ
สุขภาพ และสภาพแวดล้อม ในการควบคุมโอโซนจำเป็นต้องมีการแจกแจงแหล่งกำเนิดของสารตั้งต้น
ในการศึกษานี้ ได้นำแบบจำลองแหล่งรับมาใช้ในการแจกแจงแหล่งกำเนิดของสารอินทรีย์ระเหยได้ใน
บรรยากาศของกรุงเทพมหานคร ข้อมูลที่ใช้ในแบบจำลองได้แก่ ความเข้มข้นของสารอินทรีย์ระเหยได้
ชนิดต่างๆ ในบรรยากาศ และสัดส่วนของสารอินทรีย์ระเหยได้ชนิดต่างๆ จากแหล่งกำเนิดประเภท
ต่างๆ ในการศึกษานี้ได้เก็บตัวอย่างอากาศ ณ สถานีตรวจวัดคุณภาพอากาศของกรมควบคุมมลพิษ 4
สถานี เป็นระยะเวลา 8 เดือน ตั้งแต่เดือนกรกฎาคม 2546 ถึง เดือนกุมภาพันธ์ 2547 ครอบคลุมช่วงฤดู
ลมมรสุมตะวันตกเฉียงใต้ และตะวันออกเฉียงเหนือ โดยเก็บตัวอย่างอากาศในช่วงเช้า 8.00-12.00 น.
ทุก 6 วัน ตลอดช่วงเวลา 8 เดือน แหล่งกำเนิดสารอินทรีย์ระเหยได้ที่ศึกษา ได้แก่ ไอเสียรถยนต์เบนซิน
และรถยนต์ดีเซล ไอระเหยน้ำมันเบนซิน ก๊าซเสียจากหม้อไอน้ำที่ใช้ น้ำมันเตาเป็นเชื้อเพลิง ไอระเหย
ของสีน้ำมัน และทินเนอร์ คาร์บอนจากการเผาผลาญชีวภาพ คาร์บอนจากการย่างอาหารบนเตาถ่าน และ
อากาศจากกองขยะชุมชน ผลของแบบจำลอง (ค่าสัมประสิทธิ์การตัดสินใจ 0.95-1.00) พบว่า ในช่วง
ฤดูลมมรสุมตะวันตกเฉียงใต้ สารอินทรีย์ระเหยได้มีแหล่งที่มาจาก ไอเสียรถยนต์เบนซิน 21% ไอเสียรถ
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ลายมือชื่อนิสิต..... *Pannwadee Suwanthiga*.....
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Volatile Organic Compounds are emitted from a variety of both anthropogenic and biogenic sources. They are important precursors in photochemical reactions leading to high ground level ozone concentrations, and the formation of secondary aerosols. Therefore in controlling ozone concentration, sources of precursors need to be defined. In this study the U.S. EPA receptor model, CMB7, was used to complement the emission inventory by identifying various sources contributing to ambient VOC concentration. The receptor model methodology requires investigation of the concentration of VOCs at receptors (ambient), and the composition of VOCs at sources, which are then input to a statistical model. Ambient air samplings took place at the 4 PCD air monitoring stations. The air sampling was conducted for 8 months during July 2003 to February 2004 covering the two prevailing wind directions in Thailand, the southwest and northeast monsoon seasons. The air samples were collected in the morning between 8:00 –12:00 a.m. every 6 days at each station. VOC emission source profiles included in this study are exhaust gases from tailpipes of gasoline vehicles, exhaust gases from tailpipes of diesel vehicles, gasoline vapors, flue gas from fuel oil boilers, vapors of solvent-based paints, thinners, smoke from burning biomass, smoke from food barbequing on charcoal stoves, and air samples from municipal waste disposal. The results from CMB receptor modeling ($R^2=0.95-1.00$) showed that during the southwest monsoon season the ambient VOC concentration contribution at all stations were from the exhaust gas from tailpipes of gasoline vehicles 21%, the exhaust gas from tailpipes of diesel vehicles 5%, the vapor of gasoline 12%, flue gas from fuel oil boilers 22%, the vapor of solvent-based paint and thinner 8%, smoke from biomass burning 19%, smoke from food barbequing 2%, air samples from municipal waste disposal 4% and unexplained sources 7%. During the northeast monsoon season the ambient VOC concentration contribution at all stations were from the exhaust gas from tailpipes of gasoline vehicles 50%, the exhaust gas from tailpipes of diesel vehicles 6%, the vapor of gasoline 12%, flue gas from fuel oil boilers 2%, the vapor of solvent-based paint and thinner 3%, smoke from food barbequing 5%, air samples from municipal waste disposal 12% and unexplained sources 10%.

Field of study Environmental Management

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LIST OF ABBREVIATIONS

Emission Sources

BB	=	Biomass burning
BBQ	=	Smoke from food barbequing
DV	=	Diesel vehicles
FB	=	Flue gas from fuel oil boilers
GV	=	Gasoline vehicles
LT	=	Liquid thinner
MW	=	air samples from municipal waste disposal
VG	=	Vapor of gasoline
VP	=	Vapor of solvent-based paint

Organizations

CSIRO	=	Commonwealth Scientific and Industrial Research Organization
EU	=	European Union
PCD	=	Pollution Control Department
U.S. EPA	=	U.S. Environmental Protection Agency
WHO	=	World Health Organization

Sampling Stations

BS	=	Ban Somdej Chao Praya
DD	=	Din Daeng
JK	=	Chandrakasem
RB	=	Ratburana

Scientific Terms

CMB	=	Chemical Mass Balance
DF	=	Degree of freedom
GC/FID	=	Gas Chromatography Flame Ionization Detector
GC/MS	=	Gas Chromatography Mass Spectrometry
HC	=	Hydrocarbon
NMHC	=	Non-methane Hydrocarbon

LIST OF ABBREVIATIONS (Con't)

TDU	=	Thermal Desorption Unit
TVOC	=	Total Volatile Organic Compounds
VOCs	=	Volatile Organic Compounds

Wind Directions

NE	=	Northeast
SW	=	Southwest