

ห้องสมุดงานวิจัย สำนักงานคณะกรรมการการวิจัยแห่งชาติ



E42134

AN EMISSION ASSESSMENT OF CARBONACEOUS AEROSOLS FROM
AGRICULTURAL OPEN BURNING IN THAILAND: INTEGRATING
EXPERIMENTAL DATA AND REMOTE SENSING

MISS KANITTHA KANOKKANJANA

ID: 48828112

A THESIS SUBMITTED AS A PART OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY
IN ENVIRONMENTAL TECHNOLOGY

THE JOINT GRADUATE SCHOOL OF ENERGY AND ENVIRONMENT
AT KING MONGKUT'S UNIVERSITY OF TECHNOLOGY THONBURI

1ST SEMESTER 2010

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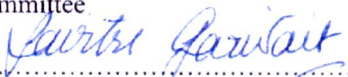
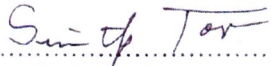
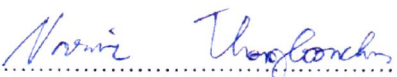

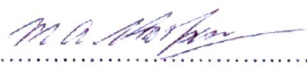
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A Thesis Submitted as a Part of the Requirements
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The Joint Graduate School of Energy and Environment
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1st Semester 2010

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Thesis Title: An Emission Assessment of Carbonaceous Aerosols from Agricultural
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Thesis Title: An Emission Assessment of Carbonaceous Aerosols from Agricultural Open Burning in Thailand: Integrating Experimental Data and Remote Sensing

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ABSTRACT

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Emission concentrations of carbonaceous aerosols, carbon dioxide (CO₂), carbon monoxide (CO), and fine particulate matter (PM_{2.5}) from open burning of agricultural residues in the rice, corn, and sugarcane field was measured by field and chamber experiments to develop field emission factors (EF) and emission inventory of these pollutants, which are specific to field burning practice in Thailand. Emissions of these pollutants from the open burning of agricultural residues have been reviewed to investigate order of magnitude of emission factors, including contribution of black carbon (BC) and organic carbon (OC) from global sources and share of agricultural residues open burning source. The emission loads were estimated by considering amount of biomass burned and emission factor.

Amount of biomass burned was determined by biomass load, fraction burned, combustion efficiency, and burned area. From field experiments, suggested sampling area of agricultural residues in paddy field is 1×2 m², and corn and sugarcane fields are 2×2 m² to obtain representative samples. Biomass load results from field experiments are irrigated rice straw 360±140 g/m², rain-fed rice straw 507±305 g/m², corn residues (leaves, stem, and envelope) 610±153 g/m², and sugarcane leaves 1,007±233 g/m², respectively. Usually, in the field that farmers burned agricultural residues, no residue has been moved out of the field before burning, so fraction burn is 100%. After paddy field burning, straw is totally burned and remaining part in the field is stubble, so combustion efficiency (CE) of straw is 100%. Burning in sugarcane field is done before harvesting to harvest easily. Total sugarcane leaves is burned (100% CE). Corn residues consist of 19% leaves, 42%±2% stem, and 39%±2% envelope. The CE of corn residues is 67%±22%.

The EF was developed by measuring emission concentrations from field experiments; however, the field EF was varied due to surrounding parameters, especially moisture and wind condition. Therefore, the research has developed methodology to measure field emission concentrations by open burn simulated chamber to reduce

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LIST OF ABBREVIATIONS

A	Burned area
BC	Black carbon
BL	Biomass load
C	Carbon
CCN	Cloud condensation nuclei
CCS	Commercial Cane Sugar
CE	Combustion efficiency
CO	Carbon monoxide
CO ₂	Carbon dioxide
EC	Elemental carbon
EF	Emission factor
ER	Emission ratio
FB	Fraction burn
Gg	Giga gram (thousand metric ton)
GPS	Global positioning system
H	Hydrogen
ha	Hectare
hPa	Hectopascals
IPCC	Intergovernmental Panel on Climate Change
M	Burned biomass
MCE	Modified combustion efficiency
MODIS	Moderate Resolution Imaging Spectroradiometer
N	Nitrogen
OAE	Office of Agricultural Economics
OC	Organic carbon
PCD	Pollution Control Department
PM	Particulate matter