Ain Shams University
Faculty of Science
Chemistry Department

Hazardous air pollutants emitted from Fossil-Fuel-fired Power Plants and their impacts on Greater Cairo air quality

A Thesis
Submitted For the Degree of Doctor on philosophy in Chemistry
(Analytical Chemistry)

By

Atef Mohamed Fathey Mohamed Mohamed Ali

M.Sc. (Inorganic Chemistry), Faculty of Science
Helwan University, Cairo, 2004

Department of Chemistry
Faculty of Science
Ain Shams University
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Approval sheet

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Supervisors	**Signature**

١. Prof.Dr. Mohamed Fathy El-Shahat
Professor of Analytical Chemistry
Faculty of Science, Ain Shams University

٢. Prof. Dr.Alia Abd El-Shakour Ali
Professor of Air Pollution Chemistry
National Research Center

٣. Prof. Dr.Nadia Mohamed El-Taieb
Professor of Air Pollution Chemistry
National Research Center

٤. Prof. Dr.Mahmoud Abd El-Magid Hassanien
Professor of Air Pollution Chemistry
Head of Air Pollution Department
National Research Center

Head of Chemistry Department

Prof. Dr.Maged Shafik Antonious Nakhla

Content

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List of Abbreviations

Abbreviation	Name
ACE	Acenaphthene
ACY	Acenaphthylene
AD	Air Dispersion Modelling Conversions and formulas
Air-Q	Air Quality health impact assessment software
ANT	Anthracene
AP	Air Pollution
APIS	Air Pollution Information System
ATSDR	Agency for Toxic Substances and Disease Registry
BAA	Benzo (a) anthracene
BAP	Benzo (a) pyrene
BapE	Benzo (a) pyrene – Equivelent
BAQ	Better Air Quality in Asian and Pacific Rim Cities
BBF	Benzo (b) fluoranthene
BEI	British Electricity International
BGP	Benzo (ghi) perylene
BKF	Benzo (k) fluoranthene
BS	Black Smoke
CalEPA	California Environmental Protection Agency
CAPMAS	Central Agency for Public Mobilization And Statistics
CARB	California Air Resources Board
CEPA	California Environmental Protection Agency
CEPC	Cairo Electric Production Company
CI	Confidence Intervals
CMEP	Chinese Ministry of Environmental Protection
CPAH	Combustion Polycyclic Aromatic Hydrocarbons
CRY	Chrysene
DBA	Dibenzo (a,h) anthracene
DRSCH	Directory of Refic Saydam Center of Hygiene
DSEWPC	Department of Sustainability Environment , Water, Population and Communities
ECDIN	Environmental Chemicals Data and Information Network
EEA	European Environment Agency
EEAA	Egyptian Environmental Affairs Agency
EMPH	Egyptian Minister of Public Health
EPA	Environmental Protection Agency
EPER	European Pollutant Emission Register
ESCOM	Electricity Supply Commission
ETCP	Earth Trends Country Profiles
FID	Flame Ionization Detection

(Continue) List of Abbreviations

Abbreviation	Name
FLT	Fluoranthene
FLU	Fluorine
GC	Gas Chromatograph
GF	Glass Fibber filters
GG	Giga-gram
GHG	Greenhouse Gases
GTP	Geothermal Training Programme
GTPP	Gandhinagar Thermal Power Plant
GZ	Guangzhou city
HK	Hong Kong
HM	Heavy Metal
IARC	International Agency of Research on Cancer
IGAC	International Global Atmospheric Chemistry
IND	Indeno (١،٢،٣-c,d) pyrene
IUPAC	International Union on Pure and Applied Chemistry
JIS	Japanese Industrial Standard
JICA	Japan International Cooperation Agency
KEMCO	The Korea Electric power Corporation
KEPCO	The Korean Energy management Corporation
LRC	London Research Center
MATES	Multiple Air Toxic Exposure Study
MDHS	Methods for the Determination of Hazardous Substances
MN	Methane Number
MOE	Ministry Of Environment
MOEE	Ministry Of Electricity & Energy
MPAP	Matra Pre-accession projects program
MW	Megawatts
NAAQS	National Ambient Air Quality Standards
NAP	Naphthalene
NAS	National Academy of Science
NATA	The National-Scale Air Toxic Assessment
NEDA	N (Naphthyl) Ethylenediamine Dihydrochloride
NEERI	National Environmental Engineering Research Institute
NETC	National Environmental Technology Centre
NG	Natural Gas
NIEHS	National Institute of Environmental Health Sciences
NLM	National Library of Medicine
NM	News Medical

(Continue) List of Abbreviations

Abbreviation	Name
OECD	Organization for Economic Cooperation and Development
OSHA	Occupational Safety and Health Administration
PAHs	Polycyclic Aromatic Hydrocarbons
PHE	Phenanthrene
PYR	Pyrene
PRIDE	Project in Development and the Environment
RR	Relative Risk
SCAQMD	South Coast Air Quality Management District
SH	Shanghai city
SVOCs	Semi-Volatile Organic Compounds
TECO	Tampa Electric Company
TSP	Total Suspended Particulate matter
UAE	United Arab Emirates
UK-APIS	United Kingdom Air Pollution Information System
USAID/Egypt	United States Agency for International Development - Egypt
USDHHS	U.S. Department of Health Human Services
U.S.DOE/EIA	U.S. the Department Of Energy/Energy Information Administration
UNEP	United Environmental Programme
USEPA	U.S. Environmental Protection Agency
WB	World Bank
WHO	World Health Organization

Abstract

Air pollution from power plants use Fossil-Fuel-fired is one of the principal sources which responsible for emission of air pollutants where it causing some of most pressing environmental problems today. Emissions of sulphur and nitrogen compounds from power stations represent a significant fraction of the total emissions of these elements to the atmosphere. Understanding their subsequent chemical reactions in the atmosphere is of fundamental importance as without it, a quantitative assessment of their contribution to local and regional scale air pollution is not possible. Power plants are significant emitters of precursor gases of fine particulate matters. It is widely used recognized that air pollution from power plants adversely affects public health.

With the turn of the ٢١st century, fossil fuels are still the predominant source of energy in most economic sectors worldwide, particularly in the electric power sector. Fossil fuels are generally composed of aliphatic hydrocarbons with impurities such as sulfur, water and other chemicals. The combustion of these chemicals results in the formation of effluents such as sulfur dioxide and oxides of nitrogen as well as carbon dioxide and other effluents. The rapid economic growth in developed as well as in developing countries has led to increases in energy consumption patterns and hence in stacks emissions that are causing air quality degradation. Encountering these emissions necessitates the need to implement strategies and plans to mitigate the impacts of energy conversion processes in general and power plants in particular on air quality and global environment.

The present work is designed to be ١st study to determine hazardous air pollutants (HAPs) concentration emitted from power plants stacks uses

different types of fossil- fuels. Assessment of gases and particulate matter concentrations and determine their chemical contents. Also estimate the risks due exposure of HAPs. Using some computer program software's to assess the impact of such pollutants on the surrounding.

Key words: HAPs - power plants - emissions – PAHs – Gaussian plume model – Air Q.٢,٢,٣ model - sulfur dioxide - oxides of nitrogen - deposited and suspended particulate matter.

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