Characterization Of Particulate Matters And Volatile

The purpose of this study is to explore the use of integrated probe vehicle, traffic and land use data to identify and characterize fine particulate matter (PM[subscript 2.5]) hot spot locations on urban arterial corridors. In addition, a preliminary analysis is conducted to consider volatile organic compound (VOC) hot spot locations. A pollutant hot spot is defined as a location on a corridor in which the mean pollutant concentrations are consistently above the 85th percentile of pollutant concentrations when compared to all locations along the corridor. In order to collect data for this study, an electric vehicle was equipped with instruments designed to measure PM[subscript 2.5] and total VOC (TVOC) concentrations. Second-by-second measurements were performed for each pollutant from both the right and left sides of the vehicle. Detailed meteorological, traffic and land use data is also available for this research. The results of a statistical analysis, including multiple regression, are used to better understand which data sources are most valuable in estimating PM[subscript 2.5] hot spot locations consistent with empirical data; knowledge is gained as to which variables have the strongest statistical relationships with traffic emissions and pollutant levels at a corridor level. A preliminary analysis is also completed to consider which variables are statistically related to TVOC hot spot locations. This research highlights the importance of considering both consistency and magnitude of pollutant concentrations when identifying hot spot locations. An objective of this research is to develop a method to identify urban arterial hot spot locations that provides a balance of efficiency (in terms of capital expenses, time, resources, expertise requirements, etc.) and accuracy.

A detailed knowledge of particulates released during combustion is vital for managing an air quality program. Comprehending the chemical and physical characteristics of particulates is essential to solve health problems, smog formations, acid rain issues, and climate changes. Over the last 30 years, environmental professionals have started investigating non-destructive techniques to evaluate physical characteristics because of its substantial affects on human health. This thesis presents Scanning Electron Microscope (SEM) integrated with image processing technique as a tool for physical characterization of particulate matter. The characterization process involves image reading, preprocessing, segmentation, feature extraction, and representation steps. In these steps, selection of optimal image segmentation algorithm is the key for analyzing the captured images of fine particulate matter. In this thesis, a novel frame work for automating the process of selecting optimal image segmentation algorithm for each image using Support Vector Machines (SVMs) is presented. In addition to this, an image processing algorithm is developed based on Sobel edge detection method for statistical determination of various morphological parameters including area, diameter and shape factor of the particles.

In 1997, the U.S. Environmental Protection Agency (EPA) established regulatory standards to address health risks posed by inhaling tiny particles from smoke, vehicle exhaust, and other sources. At the same time, Congress and the EPA began a multimillion dollar research effort to better understand the sources of these airborne particles, the levels of exposure to people, and the ways that these particles cause disease. To provide independent guidance to the EPA, Congress asked the National Research Council to study the relevant issues. The result was a series of four reports on the particulate-matter research program. The first two books offered a conceptual framework for a national research program, identified the 10 most critical research needs, and described the recommended timing and estimated costs of such research. The third volume began the task of assessing initial progress made in implementing the research program. This, the fourth and final volume, gauged research progress made over a 5-year period on each of the 10 research topics. The National Research Council concludes that particulate matter research has led to a better understanding of the health effects caused by tiny airborne particles. However, the EPA, in concert with other agencies, should continue research to reduce further uncertainties and inform long-term decisions.

Most of the data available on particulate especially the fine particles is available for the developed world and not in the developing world like India, where large population is exposed to pollutants. Most of the people in India spend 80-90% of their time indoors, where exposure to majority air pollution is quite different from that outdoors. Therefore, understanding how indoor exposure relates outdoor concentration is critical for assessment of policy interventions to reduce adverse health effects. It has been also established that there is relatively consistent increase in mortality of 0.2% per 10 gm-3 increase of PM according to National Morbidity, Mortality and Air pollution study. Particles less than 2.5 is ubiquitous and control number of atmospheric processes and effects. The measurement of indoor particles is thus essential in order to assess the total particulate exposure of the general population.

Recent advances in air pollution monitoring and modeling capabilities have made it possible to show that air pollution can be transported long distances and that adverse impacts of emitted pollutants cannot be confined to one country or even one continent. Pollutants from traffic, cooking stoves, and factories emitted half a world away can make the air we inhale today more hazardous for our health. The relative importance of this "imported" pollution is likely to increase, as emissions in developing countries grow, and air quality standards in industrial countries are tightened. Global Sources of Local Pollution examines the impact of the long-range transport of four key air pollutants (ozone, particulate matter, mercury, and persistent organic pollutants) on air quality and pollutant deposition in the United States. It also explores the environmental impacts of U.S. emissions on other parts of the world. The book recommends that the United States work with the international community to develop an integrated system for determining pollution sources and impacts and to design effective response strategies. This book will be useful to international, federal, state, and local policy makers responsible for understanding and managing air pollution and its impacts on human health and well-being.

"The overall objective of this study was to fabricate, develop and evaluate an instrument for physical and chemical characterization of aerosols in the ambient atmosphere."--Introduction, p. 1.

Research related to ambient particulate matter (PM) remains very relevant today due to the adverse effects that PM have on human health. PM are pollutants with varying chemical compositions and may originate from multiple emission sources, which directly affects their toxicity. To formulate effective control and mitigation strategies, it is necessary to identify PM sources and to estimate their influence on ambient PM concentration, a process that is known as source apportionment (SA). Depending on the geographical location and characteristics of an area, many anthropogenic and natural sources may contribute to PM concentration levels, such as dust resuspension, sea salt, traffic, secondary aerosol formation, industrial emissions, ship emissions, biomass burning, power plant emissions, etc. Different methodological approaches have been used over the years to study the aforementioned topics, but some scientific challenges remain, mainly related to the following subjects: real-time chemical analysis and SA, uncertainty estimation of SA results, and analytical optimization for PM samples. Additionally,

there are areas in the world for which the results regarding composition and sources of PM are still scarce. The objective of this collection was to include studies on all aspects of PM chemical characterization and source apportionment regarding the inorganic and/or organic fractions of PM.

This is a rapidly expanding and highly topical research area. Written by authors and editors who are well known and respected in their fields, this text looks at the health effects caused by particulate aerosols, and discusses recent legislation and future strategies.

This book presents the most up-to-date research and information regarding the origin, chemistry, fate and health impacts of airborne particulate matter in urban areas, a topic which has received a great deal of attention in recent years due to documented relationships between exposure and health effects such as asthma. With internationally recognised researchers and academics presenting their work and key concepts and approaches from a variety of disciplines, including environmental and analytical chemistry, biology, toxicology, mineralogy and the geosciences, this book addresses the topic of urban airborne particulate matter in a comprehensive, multidisciplinary manner. Topics and research addressed in the book range from common methodological approaches used to sample and analyse the composition of airborne particulates to our knowledge regarding their potential to impact human health and the various policy approaches taken internationally to regulate particulate matter levels.

Emission inventory is basic for the understanding of environmental behaviors and potential effects of compounds, however, current inventories are often associated with relatively high uncertainties. One important reason is the lack of emission factors (EFs), especially for the residential solid fuel combustion in developing countries. In the present study, emission factors of a group of pollutants including particulate matter, organic carbon, elemental carbon (sometimes known as black carbon) and polycyclic aromatic hydrocarbons were measured for a variety of residential solid fuels including coal, crop straw, wood, and biomass pellets in rural China. The study provided a large number of emission factors that can be further used in emission estimation. Composition profiles and isomer ratios were investigated and compared so as to be used in source apportionment. In addition, the present study identified and quantified the influence of factors like fuel moisture, volatile matter on emission performance. The publication of the study will be of interest and helpful to the readers in the field of air pollution, human health, fuel saving and energy consumption etc. Guofeng Shen works at the Institute of Atmospheric Sciences, Jiangsu Academy of Environmental Sciences, China.

New National Ambient Air Quality Standards for airborne particles smaller than 2.5 micrometers, called PM2.5, were issued by the U.S. Environmental Protection Agency (EPA) amidst scientific uncertainty and controversy. In response to a request from Congress, Research Priorities for Airborne Particulate Matter, the first of four books in a series, offers a conceptual framework for an integrated national program of particulate-matter research, identifies the 10 most critical research needs linked to key policy-related scientific uncertainties, and describes the recommended timing and estimated costs of such research. The committee concludes that EPA should devote more resources to investigating the relationships between fixed-site outdoor monitoring data and actual human breathing-zone exposures to ambient particulate matter and to identifying the most biologically important constituents and characteristics of particulate matter through toxicological studies. The recommended research activities are critical to determining actual exposures of human subpopulations most susceptible to harm from the most hazardous constituents of particulate matter. Future research will be an investment in public health and a means to ensure that resources spent on control technology and regulatory compliance will have a reasonable probability of success.

Soldiers deployed during the 1991 Persian Gulf War were exposed to high concentrations of particulate matter (PM) and other airborne pollutants. Their exposures were largely the result of daily windblown dust, dust storms, and smoke from oil fires. On returning from deployment, many veterans complained of persistent respiratory symptoms. With the renewed activity in the Middle East over the last few years, deployed military personnel are again exposed to dust storms and daily windblown dust in addition to other types of PM, such as diesel exhaust and particles from open-pit burning. On the basis of the high concentrations observed and concerns about the potential health effects, DOD designed and implemented a study to characterize and quantify the PM in the ambient environment at 15 sites in the Middle East. The endeavor is known as the DOD Enhanced Particulate Matter Surveillance Program (EPMSP). The U.S. Army asked the National Research Council to review the EPMSP report. In response, the present evaluation considers the potential acute and chronic health implications on the basis of information presented in the report. It also considers epidemiologic and health-surveillance data collected by the USACHPPM, to assess potential health implications for deployed personnel, and recommends methods for reducing or characterizing health risks.