

Physico-chemical Characterization of Respirable Particulate Matter in an Underground Metro Station Platform: A Case Study in Delhi

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The present study aims at temporal and spatial analysis of respirable particulate matter at the underground metro station (UMS) platform at Chandni Chowk metro station, Delhi. It measures the concentration of 8 elements, namely lead (Pb), silver (Ag), zinc (Zn), copper (Cu), iron (Fe), manganese (Mn), cadmium (Cd) and potassium (K) during peak winter season and the sample of 7 days was collected using environmental dust sampler GRIMM 1.107 model and weather station. The study includes testing of these elements by the analysis of collected respirable particulate matter using atomic absorption spectroscopy (AAS). It also evaluates I/O relationships of particulate matter and analyzes the wind rose diagram of the site. The results demonstrated that the average concentration of elements are: Fe ($3.36 \pm 1.11 \mu\text{g}/\text{m}^3$), Zn ($0.68 \pm 0.52 \mu\text{g}/\text{m}^3$), K ($0.45 \pm 0.19 \mu\text{g}/\text{m}^3$), Pb ($0.38 \pm 0.23 \mu\text{g}/\text{m}^3$), Cu ($0.13 \pm 0.06 \mu\text{g}/\text{m}^3$), Ag ($0.04 \pm 0.06 \mu\text{g}/\text{m}^3$), Mn (0.01 ± 0.06) and Cd ($0 \mu\text{g}/\text{m}^3$). The 22% of the wind blew from the eastern direction, which could have carried the gaseous emissions as well as particulate matter towards the Chandni Chowk underground metro station due to large parking and heavy traffic from the adjacent road.

KEYWORD

Indoor air quality, Undergrand metro station, Respirable particulate matter, Chandni Chowk metro station.

Preliminary Study of Noise Levels at the Periphery of Indian Institute of Science (IISc) Campus, Bengaluru

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Noise pollution can be defined as the unwanted sound, that is released to the environment and disturbing the human beings. Sources of noise pollution include industrial sources, non-industrial sources, vehicles, uncontrolled use of loud speakers, construction activities, such as drilling, etc. Noise levels from vehicles through engines and horns are the main cause of concern in cities and may potentially contribute more than 50% of total noise pollution. A preliminary study of noise monitoring around the periphery of Indian Institute of Science (IISc) campus showed the noise levels to be above the thresholds limits by 20%-45%. Noise pollution arises from vehicles plying around the campus where there are major roads and a busy traffic junction. The campus is categorized as silence zone. Traffic volume and noise levels were measured at the gates of the campus and at a major traffic junction. The study also includes remedial measures that can be implemented to reduce the noise levels inside the campus.

KEYWORD

Noise, Pollution, Indian Institute of Science, Vehicles, Decibels.

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Status of Particulate Matter in Vijayawada - A Case Study

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Vijayawada Corporation area extends over 61.88 km with a population of 14.7 lacs. It is one of the biggest city of Andhra Pradesh even before separation of the state. Now it is considered as capital of newly formed Andhra Pradesh. Particulate matter and gaseous pollutants in the ambient atmosphere of Vijayawada are increasing due to rapid increase in urbanization, congestion of roads, older vehicles and inadequate inspection of vehicles. A case study has been carried out to present the status of suspended particulate matter (SPM) and respirable suspended particulate matter (RSPM) at residential and industrial places of Vijayawada city during 2010-2014. Since finer particulate matter less than 10 microns (PM_{10}) size have been identified as potential health hazard for human beings. It has been observed that annual average concentrations of suspended particulate matter and respirable suspended particulate matter exceeded the National Ambient Air Quality Standards (NAAQS) at residential sampling station for all the 5 years of study. While suspended particulate matter and respirable suspended particulate matter concentrations are below the National Ambient Air Quality Standards values at industrial sampling station.

KEYWORD

Suspended particulate matter, Respirable suspended particulate matter, PM_{10} , National Ambient Air Quality Standards.

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Photocatalytic Degradation of Volatile Organic Compounds Using Zinc Ferrite Titania as Photocatalyst

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Visual light based photodegradation of volatile organic compounds (VOCs) benzene, toluene and xylene was studied. A visual light enabled photocatalyst zinc ferrite titania (TiO_2 (ZnFe_2O_4)) was prepared and its performance during visible light photodegradation of some volatile organic compounds was also studied. The photocatalyst was synthesized by sol-gel method and characterised for its particle size, morphology, bandgap energy and absorption wavelength using x-ray diffraction, scanning Electron microscope and UV-vis reflectance spectrometry, respectively. It was coated on a glass plate in a thin layer for photodegradation studies and showed better efficiency in photocatalytic oxidation (PCO) of benzene, toluene and xylene. The effect of irradiation time on the volatile organic compounds degradation efficiency was studied and it is almost in the stabilized condition for a period of 20 min. The rate of photocatalytic oxidation of benzene, toluene and xylene follows a first order kinetics. Experimental results reveals that the maximum degradation efficiency of benzene, toluene and xylene in batch mode was 93.53%, 93.6%, and 93.69% respectively in batch mode. Similarly, degradation efficiency of benzene, toluene and xylene in continuous mode was 14.37%, 14.5% and 14.87%, respectively.

KEYWORD

Photocatalysis, Visible light, Volatile organic compounds (VOCs), Zinc ferrite titania.

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Assessment of Noise Levels at Renovation Site, Eastern India

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The study being reported here has been carried out in an office building which was under renovation work, in Kolkata city of Eastern India. Continuous equivalent sound pressure level L_{eq} has been measured by hand held analyzer type-2250L. The study involves 76 subjects (36 workers and 30 office staff members as control group). The result reveals that noise level in certain activities, like railing polishing and marble cutting is more than the accept limits of 90dB (A) for 8 hr exposure stipulated by OSHA and IFA (1948). While noise level in other activities, like plaster removal from walls, drilling of surfaces, etc., is less than 90 dB (A). The results of personnel interview reveal the followings : (i) Speech interference by 97% and 64% of control group and workers, respectively, (ii) 44% of workers and 77% of control group are aware about adverse effects of noise exposure, (iii) noise annoyance by 64% of workers but 100% of control group, (iv) only 6% of workers using hearing protection device and (v) 14% of workers know about the benefits of using PPE. The study demonstrates the presence of high noise at renovation site and high noise annoyance by control group than workers. However, workers are at high risk of developing noise induced hearing loss (NIHL).

KEYWORD

Speech interference, Noise annoyance, Hearing protection device, Personal protective equipments, Noise induced hearing loss.

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Dispersion Pattern of SO₂ in the Neighbourhood of Industrial Stationary Sources

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This study analyzes the monthly spatial distribution pattern of sulphur dioxide (SO₂) concentrations measured at ground-level locations, as a result of atmospheric dispersion due to SO₂ emissions from the multiple industrial point sources, located in Ennore-Manali-Tiruvotriyur Industrial Estates, spreaded over a large land area, in North Chennai Air Basin. This study-area is ideally suited for the application of the 'industrial sources complex short term model- version 3 (ISCST3)' to ascertain the dispersion pattern of sulphur dioxide from 192 industrial stacks, emitting a total quantity of 364.56 gm of SO₂/sec. The heights of stacks vary from 10.0 m to 275.0 m. The data corresponding to a total period of 12 months from June 2011 to July 2012, were considered in the study. Emission inventory was documented. The SO₂ data measured by the Tamil Nadu Pollution Control Board (TNPCB) at their continuous ambient air quality monitoring stations (CAAQMS) were used. Meteorological data were obtained from Indian Meteorological Department. The 16-sector wind direction scheme was employed, namely N, NNE, NE, ENE, E, ESE, SE, SSE, S, SSW, SW, WSW, W, WNW, NW and NNW, with the resolution of 22.5 degree in a full circle of 360 degree. The various wind speed classes and the relevant stability categories were used as per standard procedures. USEPA's ISCST3-model was employed to compare the predicted values of ground-level SO₂ concentrations with the measured SO₂ concentrations. The model evaluation showed that there was a good agreement between the predicted concentrations and measured concentrations statistically, having index agreement (d) of 0.77 and the coefficient of correlation (r²) being 0.90. The spatial distribution pattern of SO₂ revealed that it varies every month, depending on the prevailing meteorological and seasonal (monsoon-based) climatic conditions of the month. This study predicts that August and September in the pre-monsoon season and November in the monsoon season were the critical periods receiving higher ground-level concentrations of SO₂, ranging between 27 µg/m³ to 30 µg/m³.

KEYWORD

Dispersion modeling, Emissions, Point sources, Monsoon season, Wind speed classes, Wind direction sectors, Ground-level concentrations, Sulphur dioxide, Statistical evaluation.

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Environmental Impact of Flyash From Talcher Thermal Power Station, With Special Reference to Heavy Metals

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Flyash is a waste product of coal burning in the thermal power stations. Several million tonnes of flyash are produced globally every day. Very little amount of flyash is being utilized purposefully and the rest amount contaminate the environment. In the present study flyash from Talcher Thermal Power Station, Odisha polluted the water quality by changing its physico-chemical properties. Flyash deposition in soil also increases the heavy metal concentrations in our study. 12 plant samples of aquatic and terrestrial habits were investigated for metal concentration indicated a low amount of accumulation below the toxic range set by EPA. This paper attempts to focus on overall environmental status of Talcher Thermal Power Station and its surroundings.

KEYWORD

Flyash, Soil, Plants, Water quality, Heavy metals.

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Health Impacts of Vehicular Pollution on the Road Side Residents

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Air pollution is now the fifth largest killer in India, says newly released findings of Global Burden of Disease report'. Vehicular pollution is responsible for many health related problems in the urban areas. The air pollution status in Delhi/NCR has undergone many changes in terms of the levels of pollutants and the control measures taken to reduce them. In this study a questionnaire survey was conducted to assess the health status of people who live near road in heavy traffic areas. The common problems which were reported by people due to vehicular pollution were headache, throat irritation, asthma, respiratory problems, anxiety, hearing loss, irritability, fatigue/drowsiness, nasal congestion, eye irritation, nose irritation, sneezing and skin irritation; it was also assumed that long term exposure of this pollution air as well as noise leads to lung cancer, chronic bronchitis and permanent hearing loss.

KEYWORD

Vehicular pollution, Air pollution, Health effects, Urban areas, Pollutants.

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Natural Radioactivity of Types Coal Consumed in Saudi Arabia

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Radioactivity naturally occurring due to the presence of the radionuclides: ^{40}K , ^{238}U , ^{226}Ra and ^{232}Th in the most kind of coal which consumed in Saudi Arabia were measured by using gamma ray spectrometer (HYPGe). The average activity concentrations of ^{238}U , ^{40}K , ^{232}Th and ^{226}Ra in coal were measured. All observed results except the Somali and Iran samples are at the safe range. To assess radiological risk arising to the use of coal for heat homes and cook foods, the absorbed gamma doses in air (D), radium equivalent activity (Ra_{eq}), annual effective dose ($AEDE_{indoor}$) and external hazards index (H_{ex}) have been determined. The obtained results are less than the global average values.

KEYWORD

Natural radioactivity, Activity concentrations, Absorbed dose rate, Radium equivalent activity, Annual effective dose, External hazard.

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Impacts Analysis of Emissions From Biodiesel and Washing Water

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Producing quality biodiesel with favourable environmental implications is of great importance in order to achieve sustainable energy management. This research is focused on the impact analysis of emissions from biodiesel produced through alkaline catalysed transesterification of waste groundnut oil (WGO), waste soyabean oil (WSO) and crudepalm kernel oil (CPKO), using SIMAPRO 7.33. In this research, the comparative analysis of the emissions from 1 kg biodiesel produced was carried out. Waste groundnut oil biodiesel emissions had the most pronounced impact on human health : Waste groundnut oil biodiesel had 2.94×10^{-10} kg emissions, waste soyabean oil biodiesel released 2.40×10^{-10} kg non-environmentally friendly substances, while crudepalm kernel oil biodiesel had 1.85×10^{-10} kg emissions. On damage to ecosystem quality, emissions from waste groundnut oil biodiesel biodiesel was 1.25×10^{-3} kg, 9.95×10^{-4} kg emissions from waste soyabean oil biodiesel and 4.39×10^{-4} kg emissions from crudepalm kernel oil biodiesel. The result of damage to climate change showed that waste soyabean oil biodiesel contributed the most with 1.54×10^{-6} kg CO₂, followed by waste groundnut oil biodiesel with 1.32×10^{-6} kg CO₂ and crudepalm kernel oil biodiesel with 1.18×10^{-6} kg CO₂. Single score result showed that the increasing order of damage on the 3 categories considered is human health, climate change and then ecosystem quality.

KEYWORD

Biodiesel, Impact analysis, Transesterification.