Air Pollutants

1- IoT enabled environmental toxicology for air pollution monitoring using AI techniques

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Abstract:
In past decades, the industrial and technological developments have increased exponentially and accompanied by non-judicial and un-sustainable utilization of non-renewable resources. At the same time, the environmental branch of toxicology has gained significant attention in understanding the effect of toxic chemicals on human health. Environmental toxic agents cause several diseases, particularly high risk among children, pregnant women, geriatrics and clinical patients. Since air pollution affects human health and results in increased morbidity and mortality increased the toxicological studies focusing on industrial air pollution absorbed by the common people. Therefore, it is needed to design an automated Environmental Toxicology based Air Pollution Monitoring System. To resolve the limitations of traditional monitoring system and to reduce the overall cost, this paper designs an IoT enabled Environmental Toxicology for Air Pollution Monitoring using Artificial Intelligence technique (ETAPM-AIT) to improve human health. The proposed ETAPM-AIT model includes a set of IoT based sensor array to sense eight pollutants namely NH3, CO, NO2, CH4, CO2, PM2.5, temperature and humidity. The sensor array measures the pollutant level and transmits it to the cloud server via gateways for analytic process. The proposed model aims to report the status of air quality in real time by using cloud server and sends an alarm in the presence of hazardous pollutants level in the air. For the classification of air pollutants and determining air quality, Artificial Algae Algorithm (AAA) based Elman Neural Network (ENN) model is used as a classifier, which predicts the air quality in the forthcoming time stamps. The AAA is applied as a parameter tuning technique to optimally determine the parameter values of the ENN model. In-order to examine the air quality monitoring performance of the proposed ETAPM-AIT model, an extensive set of simulation analysis is performed and the results are inspected in 5, 15, 30 and 60 min of duration respectively. The experimental outcome highlights the optimal performance of the proposed ETAPM-AIT model over the recent techniques.

2- Electrochemical detection of nitrate with carbon nanofibers and copper co-modified carbon fiber electrodes

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Abstract:
Obvious air pollutants are both environmental and health hazards, which is likely to cause respiratory problems in infants and the elderly. Airborne nitrates are a significant part of water-soluble ions in air pollutants. The detection of these nitrate ions would go a long way to help manage and control such ions in air pollutants and their disastrous effects. A critical challenge in the detection of nitrate is the uncontrollable concentration and signal overlapping with other ions. This study aimed at detection of nitrate ion using carbon fibers microelectrodes. A novel copper/carbon nanofibers/carbon fiber microelectrode (Cu/CNFs/CFE) was designed and used to detect nitrates in a simple, inexpensive and facile approach. The prepared Cu/CNFs/CFE has shown an increased sensitivity and a lower limit of detection for nitrate compared to bare CFE. This increase in sensitivity is due to the increased electrode surface area with a Cu/CNFs coating and more mass transport channels with superior electrocatalytic abilities. Under optimal experimental conditions, the Cu/CNFs/CFE demonstrated the detection limit of nitrate was 0.8 mu M (S/N = 3) and linear range was 5 mu M-8000 mu M. Finally, it's pointed out the nitrate content that four air pollutant samples obtained from the cities of Yuci and Taiyuan in Shanxi province of China.

3- Effect of lockdown amid COVID-19 pandemic on air quality of the megacity Delhi, India

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Abstract:
Amid the COVID-19 pandemic, a nationwide lockdown is imposed in India initially for three weeks from 24th March to 14th April 2020 and extended up to 3rd May 2020. Due to the forced restrictions, pollution level in cities across the country drastically slowed down just within few days which magnetize discussions regarding lockdown to be the effectual alternativemeasures to be implemented for controlling air pollution. The present article eventually worked on this direction to look upon the air quality scenario amidst the lockdown period scientifically with special reference to the megacity Delhi. With the aid of air quality data of seven pollutant parameters (PM10, PM2.5, SO2, NO2, CO, O-3 and NH3) for 34 monitoring stations

spread over themegacity we have employed National Air Quality Index (NAQI) to show the spatial pattern of air quality in pre and during-lockdown phases. The results demonstrated that during lockdown air quality is significantly improved. Among the selected pollutants, concentrations of PM10 and PM2.5 have witnessed maximum reduction (>50%) in compare to the prelockdown phase. In compare to the last year (i.e. 2019) during the said time period the reduction of PM10 and PM(2.)5 is as high as about 60% and 39% respectively. Among other pollutants, NO2 (-52.68%) and CO (-30.35%) level have also reduced during-lockdown phase. About 40% to 50% improvement in air quality is identified just after four days of commencing lockdown. About 54%, 49%, 43%, 37% and 31% reduction in NAQI have been observed in Central, Eastern, Southern, Western and Northern parts of the megacity. Overall, the study is thought to be a useful supplement to the regulatory bodies since it showed the pollution source control can attenuate the air quality. Temporary such source control in a suitable time interval may heal the environment.

4- Marine microplastics as vectors of major ocean pollutants and its hazards to the marine ecosystem and humans

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Abstract:
Microplastic pollutes water, land, air, and groundwater environments not only visually but also ecologically for plants, animals, and humans. Microplastic has been reported to act as vectors by sorbing pollutants and contributing to the bioaccumulation of pollutants, particularly in marine ecosystems, organisms, and subsequently food webs. The inevitable exposure of microplastic to humans emphasises the need to review the potential effects, exposure pathways, and toxicity of microplastic toward human health. Therefore, this review was aimed to reveal the risks of pollutant sorption and bioaccumulation by microplastic toward humans, as well as the dominant types of pollutants sorbed by microplastic, and the types of pollutants that are bioaccumulated by microplastic in the living organisms of the marine ecosystem. The possible factors influencing the sorption and bioaccumulation of pollutants by microplastic in marine ecosystems were also reviewed. The review also revealed the prevailing types of microplastic, abundance of microplastic, and geographical distribution of microplastic in the aquatic environment globally. The literature review revealed that microplastic characteristics, chemical interactions, and water properties played a role in the sorption of pollutants by microplastic. The evidence of microplastic posing a direct medical threat to humans is still lacking albeit substantial literature has reported the health hazards of microplastic-associated monomers, additives, and pollutants. This review recommends future research on the existing knowledge gaps in microplastic research, which include the toxicity of microplastic, particularly to humans, as well as the factors influencing the sorption and bioaccumulation of pollutants by microplastic.

5- Association between short-term exposure to air pollution and COVID-19 infection: Evidence from China

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Abstract:
The novel coronavirus pneumonia, namely COVID-19, has become a global public health problem. Previous studies have found that air pollution is a risk factor for respiratory infection by carrying microorganisms and affecting body's immunity. This study aimed to explore the relationship between ambient air pollutants and the infection caused by the novel coronavirus. Daily confirmed cases, air pollution concentration and meteorological variables in 120 cities were obtained from January 23, 2020 to February 29, 2020 in China. We applied a generalized additive model to investigate the associations of six air pollutants (PM2.5, PM10, SO2, CO, NO2 and O-3) with COVID-19 confirmed cases. We observed significantly positive associations of PM2.5, PM10, NO2 and O-3 in the last two weeks with newly COVID-19 confirmed cases. A 10-mu g/m(3) increase (lag0-14) in PM2.5, PM10, NO2, and O-3 was associated with a 2.24% (95% CI: 1.02 to 3.46), 1.76% (95% CI: 0.89 to 2.63), 6.94% (95% CI: 2.38 to 11.51), and 4.76% (95% CI: 1.99 to 7.52) increase in the daily counts of confirmed cases, respectively. However, a 10-mu g/m(3) increase (lag0-14) in SO2 was associated with a 7.79% decrease (95% CI: -14.57 to -1.01) in COVID-19 confirmed cases. Our results indicate that there is a significant relationship between air pollution and COVID-19 infection, which could partially explain the effect of national lockdown and provide implications for the control and prevention of this novel disease.