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Geo-Environmental Hazard Vulnerability and Risk Assessment Over South Karanpura Coalfield Region of India

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Abstract

Coal is the major energy resource in India, as well as in the world. It is a prime source of energy for industrial growth but coal mining and uses can harm the land, air quality, surface and sub-surface water, and human health. In the present study, attempts were made to estimate the geo-environmental hazards and risks in South Karanpura Coalfield region using information on land use/land cover (LU/LC), aerosol optical thickness (AOT), precipitable water vapor (PWV), and temperature conditions integration with socio-economic vulnerability in geographic information system (GIS) environment. AOT, PWV, and temperature were measured using a MICROTOPS-II Sunphotometer instrument during the month of January 2011. Census data were used to examine the socio-economic vulnerability of the region through computation of population density, total workers, children below ages 0–6 years and literacy rate. Results indicated that 32.03% (122.16 km^2) of the area is in a high to very high risk zone in the central and eastern part of study area. The majority of the risk-prone areas are present in the vicinity of industry and mining areas also have a higher population density.

Keywords: Geo-environmental hazards, socio-economic vulnerability, risk, coal mining, GIS

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Green Solvents for Biocatalysis
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Chapter 1 - Biocatalysis in industrial biodiesel and bioethanol production

Dipesh Kumar [a], Ayan Banerjee [b], Bhaskar Singh [c]

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Abstract

The attractiveness of renewable alternative transportation fuels has substantially increased over time. Biofuel mandates, energy insecurity, environmental pollution, and commitments to mitigate climate change are the prominent drivers of the biofuel

Mirza Hasanuzzaman
Susana Araújo
Sarvajeet Singh Gill *Editors*

The Plant Family Fabaceae

Biology and Physiological Responses to Environmental Stresses

Springer

Chapter 11

Probiotics, prebiotics, and synbiotics: Current status and future uses for human health

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11.1 Introduction

The primary role of nutrition is to supply essential nutrients for development and growth of human body. Nowadays, researchers and nutritionists are more interested in the secondary role of nutrition, which involves the maintenance of health and combating diseases by defining bacterial association with human health. Prebiotic, probiotic, and synbiotic are modern era words, which came into existence to redefine the association that exists between the microbes and their effects on human health. The composition and safety of intake products is of utmost importance in today's world that is surviving on highly processed food. Considering the plague of 21st century such as food poisoning, allergy, obesity, cancer, and cardiovascular diseases, the nutritional quality of food is essential for human health. Various health benefits associated with prebiotics, probiotics, and synbiotics have been reported recently (Markowiak and Śliżewska, 2017). In early 1990s, the first scientist to report the beneficial effects of microbes on human gastrointestinal tract (GIT) was Eli Metchnikoff. Successively, he correlated the "Theory of Longevity" with the prolonged youth and a healthy old age that was observed in the peasants of those times residing in Balkan, who used cultured milk as an addition to their diet (Kaufmann, 2008). Since then, the search continues for understanding the importance of various food components and nutrients in enhancing and improving human health (Pandey et al., 2015). According to Webb (2011), thorough research in this area has resulted in plenty of food labels known to have distinct health benefits which are termed as functional foods. Based on the research carried out by Cencic and Chingwaru (2010), a functional food not only enhances vital physiological functions in human body, but also provides required amount of nutritional components for proper growth and development of human body.

The word "Probiotic" is derived from a Greek word which means "for life" and is used to define viable nonpathogenic microbes and their beneficial effects on hosts. The term "Probiotics" was coined by Ferdinand Vergin in 1954, when he was investigating the harmful effects of microbial substances and other antibiotics on the gut microflora (Vergin, 1954). He found that "Probiotika" was advantageous for the gut microbial population. After that, in 1965, Lilly and Stillwell redefined probiotic as a substance produced by one microorganism, capable of stimulating the growth of other microorganism (Lilly and Stillwell, 1965). Several attempts were made to modify and change the definition of probiotics. Subsequently in 1989, the term probiotic was further defined by Fuller as live nonpathogenic microbes, which when consumed exert a positive influence on host's physiology and health (Fuller, 1989). According to the latest definition provided by Food and Agriculture Organization (FAO, 2002) of the United Nations and World Health Organization (WHO) in 2002, "Probiotics are live microorganisms which when administered in adequate amounts confer a health benefit to the host". The most commonly marketed probiotics are lactic acid excretors like *Lactobacilli* and *Bifidobacteria*, which are generally added to fermented milk products or are available as lyophilized forms.

Prebiotics are nondigestible components of food, which help in improving the health conditions of the host by stimulating the growth of microbes inhabiting the gastrointestinal region of host (Gibson and Roberfroid, 1995). This definition was upgraded in 2004, according to which prebiotics were reported to be those components that were selectively fermented allowing specific changes in the composition or activity of microbes inhabiting gastrointestinal tract (GIT) of human body,

New and Future Developments in Microbial Biotechnology and Bioengineering. https://doi.org/10.1016/B978-0-12-820528-0.00012-0

Moso bamboo (*Phyllostachys edulis* (Carrière) J.Houz.)–one of the most valuable bamboo species for phytoremediation

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1 Introduction

Bamboo is one of the most primitive, fastest growing, and diverse group of plants in the world belonging to the subfamily of *Bambusoideae* under the family *Poaceae*. Bamboo grows especially in East and Southeast Asian, African, Central and South American countries (Banik, 2000) in tropical and subtropical areas due to the wide tolerance to climatic and edaphic conditions. Some species also grow successfully in mild temperate regions in Europe and North America (Soderstrom and Ellis, 1988). Around 80% of the total bamboo species of the world are confined to China, India, and Myanmar (Sharma et al., 2016). Some 3 million years ago, bamboo vanished from Europe sometimes during the last ice age (Recht and Wetterwald, 1992). Various authors reported varied information regarding the number of species and genera of bamboos found worldwide, in China and India (Table 12.1). There is *ca*. 1500 species of bamboos under 87 genera are found worldwide (Ohrnberger, 1999; Li and Kobayashi, 2004). China has the world's richest bamboo resource with about 500 species under 39 genera (Di and Wang, 1996), which account for one-third of the world's total bamboo species. The bamboo plantation area is increasing with an average rate of 1%–2% in China (Zhou et al., 2011). About 25% of bamboos of the world are found in India particularly abundant in the Western Ghats, and Northeast India (Biswas, 1988; Rai and Chauhan, 1998) in the tropical, sub-tropical, and temperate regions where the mean annual rainfall and temperature ranges between 1200 and 4000 mm and 16°C–38°C, respectively (Tewari, 1992). Bamboos occupy 13% of the total forests area of the country (Varmah and Bahadur, 1980) and two-thirds of bamboos in the country are available in the Northeast India (Sharma et al., 2016). It can grow from the coastal plains to Himalaya upto an elevation of 3700 m (Mehra and Sharma, 1975). Bamboos are great colonizer and adaptable to a wide range of habitats and some bamboos have fast (culm) growth rates from *ca*. 7.5–100 cm per day (Buckingham et al., 2011). It characterized by profuse fibrous root/rhizome, hollow, cylindrical, and woody stem,

Phytoremediation Potential of Perennial Grasses. http://dx.doi.org/10.1016/B978-0-12-817732-7.00012-2

Chapter 1

Tiny microbes, big yields: Microorganisms for enhancing food crop production for sustainable development

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1.1 Introduction

Due to the rising demand for food and fiber at the global level, improved and sustainable agricultural practices are required to combat adverse climatic conditions. The incorporation of such sustainable practices would be preferable over classical practices for improved yield of agricultural goods from the existing arable land under deteriorating soil and water quality conditions. "Sustainable increases in agricultural productivity are critical to address multiple sustainable development goals (SDGs) including zero hunger (SDG 2), no poverty (SDG 1), and good health and well-being (SDG 3)." According to the survey, global population is expected to exceed 9 billion by 2050. Hence, to meet the food requirement of such large population, crop productivity needs to be increased by 70%–100%. Additionally, these advanced practices act as a savior of agricultural produce against new developing and prevalent pests and pathogens. 'Phytomicrobiome' is a sustainable and effective approach for the improvement in both farm productivity and food quality (Yadav et al., 2020b, 2020c). The harnessing of natural resources in the agriculture sector not only improves farm productivity but also promotes environmental and social outcomes in a positive manner. In conventional farming, widespread use of chemical-based fertilizers and pesticides is required to increase agricultural productivity substantially (Kour et al., 2020d; Yadav et al., 2020d). The applications of such chemical-based strategy in the farming sector have contributed enormously to fulfill the food availability and poverty mitigation goals. However, this chemical-based conventional farming is considered environmentally unfriendly due to extreme and indiscriminate use of chemicals, which causes potential threats to environment which in turn have a negative impact on human health and food security. These conventional chemical-based approaches not only increased crops susceptibility toward pests/pathogens but also resulted in food contamination and contributed significantly to soil degradation and biodiversity loss (Tilman et al., 2002).

Agriculture sector in the developing countries are facing major challenges associated with yield enhancement in terms of quality and quantity in an environmentally friendly and economical (no increase in farming costs) manner. It is evident from earlier reports that use of conventional agricultural practices to maintain a balance between demand and supply is neither economically nor environmentally feasible. Hence, global urge for complimentary and sustainable approaches to sustainably meet the global food security demands has led to the development of amended and innovative sustainable crop production methods.

1.2 Microbiome technology

The microbiome technology is one such way in which the aid of beneficial plant-associated microbiome helps to sustainably enhance the quality and quantity of farm produce using minimum resources (Kour et al., 2020a, 2020b). This technology has the potential to minimize the environmental distress. Microbiomes are the host-associated microbial communities which inhabit multiple tissue types on the host surfaces as well as colonize both inter- and intracellular host habitats (Medina and Sachs, 2010; Huttenhower et al., 2012). Among different microbial communities, eubacteria often

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Urban Risk and Resilience to Climate Change and Natural Hazards: A Perspective from Million-Plus Cities on the Indian Subcontinent

Amit Kumar[1], Diksha[1], A. C. Pandey[1], and M. L. Khan[2]

ABSTRACT

This chapter addresses the multiple linkages between climate change, hazard events in urbanized areas, and their intrinsic relationship leading to increased exposure of risk of urban dwellers, emphasizing the Indian scenario. Cities are complex and interdependent systems, extremely vulnerable to risks both from natural and human-made hazards. The cities in India and Nepal with populations greater than one million (million-plus cities) share a considerable proportion of the total urban population (382.71 million; > 69.6% in 2015). All megacities are exposed long-term to immediate occurring natural hazards ranging from geological (earthquake ground shaking and mass movements) to meteorological (floods and storms) to extreme climatic events (heat and cold waves and wildfires), which necessitate adoption of different risk-reduction strategies for varying conditions. The frequency and intensity of natural disaster has increased in recent decades and has induced higher risk due to the high concentration of population in limited spheres of urban regions. In the last four decades, the frequency of recorded natural disasters has increased about threefold, from over 1,300 events in 1975–1984 to over 3,900 in 2005–2014. It poses particular threats to lives, urban infrastructures, energy supplies, and transport connectivity. The risk multiplies because of poor adaptation and resilience due to poverty, poor governance, and degraded infrastructure, which further increase the severity of disaster impact on communities. The scenario is often more destructive in terms of urban hazard and risk in developing nations, as the low-income and middle-income nations lack basic amenities, proper planning strategies, technology, and, most important, a sound economic system to deal with the increasing hazard and risk. This study emphasizes disaster events occurring in the last four decades (1980s–2010s) in million-plus cities in India, Nepal, and Bangladesh. It also shows the necessity to move toward structuring resilience for disaster-affected communities and regions by empowering the disaster-management authorities, regional planners, policy makers, and governing bodies to build a sustainable risk-reduction plan.

3.1. BACKGROUND

Urban areas are the engines of growth and chronologically occur on Earth as the product of interaction between humans and the environment in a heuristic process of adaptation and responses (Ramachandran, 1999; Kumar, 2016). Urban areas primarily comprise built-up environments, high populations, various secondary and tertiary economic activities, and induce continuously large land transformation in the vicinity (Yong et al., 2007). The pivotal process of urbanization contributes to significant economic and social transformations of rural area and redistribution of populations from rural to urban settlements (Peng et al., 2000). The varied opportunities,

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Chapter 12
Sustainable Production of Polyhydroxyalkanoates (PHAs) Using Biomass-Based Growth Substrates

D. Kumar and B. Singh

12.1 Introduction

With an annual production of well over 200 million tonnes, a major share of the petroleum-based polymers (mainly plastic) find their way into the environment as industrial, commercial, and household wastes. Their primary disadvantage is their inherent resistivity toward microbial degradation, and as a result, they keep on piling in the environment leading to several undesirable impacts. The harmful effects of plastic and its precursor on the environment are well recognized, and as a result the past few decades have seen dedicated research and development efforts toward the identification and development of their alternatives. Taking note of the urgency, several nations have banned the usage of plastic carry bags in various capacities. Bioplastics are biologically sourced materials having properties comparable to that of petroleum-derived plastics and are reported to have a lower ecological footprint. The global production of bioplastics in 2013–2014 stood at approximately 1200 kilotonnes per annum [20]. Bioplastics can be derived from biomass of various origins including lignocellulosic residues, municipal solid wastes, virgin/used cooking oil, glycerol, starch, and several other renewably sourced forms of carbon. However, the high production cost is the single most significant impediment in the commercialization of bioplastics, which costs approximately 20–80% higher than their petroleum-based counterparts [47]. Lignocellulosic biomass remains to be the single most significant biomass reserve for the production of a range of valuable commodities. However, their valorization through bioprocessing is restricted mainly due to their recalcitrance toward microbial degradation. Accordingly, a biomass pretreatment step is usually required to make lignocellulosic residues amenable to bioprocessing.

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Ecological Consequences of Genetically Modified Crops on Soil Biodiversity

5

Aditya Kumar Jha, Sukalyan Chakraborty, Khushbu Kumari, and Kuldeep Bauddh

Contents

Abstract

Uncontrolled population raised an important concern of food security in front of the entire world. To increase the global food productivity, numerous technological interventions have been done, and development of genetically modified organisms (GMOs) especially crops was considered as a novel approach. Genetically modified crops (GMCs) are designed in such a way to fight against both biotic and abiotic stresses and to give a better yield than conventional crops. Several GMCs have been adopted in many countries of the world and many more are under trial. Like many other technologies, use of GMCs in the natural fields is found to have some ecological complications like their impacts on non-target

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Nanoagroparticles: An Emerging Trend in Modern Agriculture System

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Ritu Singh, Avimanu Sharma, Nisha Kumari, Monalisha Behera, Sanjeev Kumar, and Arif Jamal Siddiqui

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Abstract

The application of nanotechnology in agricultural domain has drastically transformed the traditional methods of agriculture. The development of nanoagroparticles is not only enhancing the crop production but also improving the food quality, keeping in check the environmental pollution. Several nano-

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Nanoagroparticles: An Emerging Trend in Modern Agriculture System

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Abstract

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1 Sustainable Agricultural Approaches for Enhanced Crop Productivity, Better Soil Health, and Improved Ecosystem Services

Lala Saha and Kuldeep Bauddh

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Abstract

Agriculture is an important sector that provides food, fiber, and fuel, and other vital commodities which possibly sustains life on Earth. In recent time, the

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Mining, Agriculture Change and Resilience: Reflections from Indigenous Knowledge in the Anthropocene

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Rajanikant Pandey

Contents

Abstract

This chapter highlights the impact of iron mining on the subsistence-based agricultural practices of Ho people in Noamundi, Jharkhand. Historically, the Ho's relationship with natural environment has been shaped by their specific existence as subsistence cultivators and has been termed locally as 'Ho Honko of Hodesum' (the Ho people of Ho country). The unregulated and rapid pace of mining today has transformed this territory into a capitalistic 'resource frontier'. Iron mining has irreversibly damaged the subsistence economy, as well as the eco-cosmological associations of people with the natural environment. The impact of mining on local agricultural economy is being negotiated on an everyday basis. The chapter describes the Ho's subsistence-based agricultural activities to delineate the indigenous endurance mechanism within mining-

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8 Suitability of Coupling Application of Organic and Inorganic Fertilizers for Crop Cultivation

Susmita Karmakar, Arijita Bhattacharyya, Bappa Ghosh, Rajeshwari Roy, Sanjeev Kumar, Biswajit Kar, and Gautam Saha

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Application of Biochar in Agriculture: A Sustainable Approach for Enhanced Plant Growth, Productivity and Soil Health

6

Shahrukh Nawaj Alam, Zaira Khalid, Sweta, Bhaskar Singh, Abhishek Guldhe, D. K. Shahi, and Kuldeep Bauddh

Contents

Abstract

Soil quality degradation is one of the major outcomes of environmental pollution that can be characterized by deficient nutrients and concurrent presence of toxic substances in the agroecosystems. To enhance crop productivity, farmers use uncontrolled synthetic fertilizers that further deteriorate the soil health. Several

Shahrukh Nawaj Alam and Zaira Khalid contributed equally to this chapter.

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7 Role of Starch Polymer-Coated Urea in the Mitigation of Greenhouse Gas Emissions from Rice and Wheat Ecosystems

Khushboo Gupta, Nirmali Bordoloi, Kushal Kumar Baruah, and Dipti Gorh

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Abstract

The excessive use of synthetic nitrogen fertilizer in agriculture interferes in natural ecosystem functioning and pollutes the environment through nitrogen leaching, volatilization, nitrification, and denitrification. The consumption of

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Chapter 4

ROLE OF PLANT GROWTH REGULATORS IN AMELIORATING HEAVY METAL CAUSED OXIDATIVE STRESS IN PLANTS: AN UPDATE

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ABSTRACT

Soil contains different types of heavy and trace metal elements. When these metals are present in high concentration, they interfere with various metabolic and physiological processes of plants, reducing their growth and causing serious environmental issues. Heavy metal (HM) pollution in soil is one of the major threats for the ecosystem and is an alarming

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Climate Change Impacts and Implications: An Indian Perspective

Gajendra Kumar, Rima Kumari, B. S. P. C. Kishore, Purabi Saikia, Amit Kumar and M. L. Khan

Abstract Climate change is one of the most complex global environmental problems, impacting the physical and biological systems of aquatic, terrestrial and marine environments. India is among one of the most vulnerable countries that has already been experiencing changes in climate and the impacts of climate change. Various sectors such as agriculture, forestry, health, socio-economy, etc. have found to be severely affected by the implications of climate change in the country. Significant impacts over the forest ecosystems, global biodiversity and ecosystem integrity have also been observed in recent days. Apart from reduction in forest productivity, a shift in the forest type boundaries along altitudinal and rainfall gradients have been found. Loss of sea ice, rapid warming, and higher organic inputs affect marine and lake productivity, while combined impacts of wildfire and insect outbreaks decrease forest productivity. All these emerging uncertainties due to climate change have found to aggravate the problems of future food security within the country. Despite putting numerous efforts to mitigate the effects of climate change, India has failed in responding sufficiently in dealing the issue of climate change. Thus, it is imperative to come up with more effective adaptation and mitigation strategies in order to combat the effects of climate change.

Keywords Climate change · Implications · Adaptation · Mitigation

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Forest Resources of Jharkhand, Eastern India: Socio-economic and Bio-ecological Perspectives

Rahul Kumar and Purabi Saikia

Abstract Jharkhand is one of the biodiversity rich states of India because of its origin, diverse physiographic and climatic conditions. It is well known due to its tribal populations, mineral resources, and its vast forest resources. Forest resources are considered as a commodity of high value across the state as most of the locals are dependent for their daily subsistence needs mainly for food and fuelwood. Forests play an important role in the economic, cultural and social lives and supporting rural livelihoods and food security in Jharkhand. Jharkhand is home to tropical moist deciduous and tropical dry deciduous forests and the dominant plant species like *Shorea robusta, Diospyros melanoxylon, Pterocarpus mersupium, Gloriosa superba, Butea monosperma, Madhuca longifolia,* etc. Commonly extracted forest produces are timber, fuel wood, fodder, and a range of Non-Timber Forest Products (NTFPs) such as fruits, nuts, edible fungi, vegetables, fish, animals and medicinal plants, resins, essences, and a range of barks and fibers such as bamboo, rattans, palms and grasses. Over-exploitation of useful plants, lack of knowledge and awareness about the plants' present population status, habitat alteration and specificity, narrow range of distribution, over-grazing are some of the severe threats endangering the existing populations of important plants. Additionally, natural enemies such as pathogens, herbivores and seed predators could substantially limit the abundance of rare plant species in any given area. Collection of plant materials, especially of rare and endangered plant species from natural habitats for various experimental purposes by researchers, also poses a threat on their natural population in the wild. Realizing the continuous depletion of these valuable resources, attempts should be made for its large-scale cultivation and multiplication in order to meet its escalating demand as well as long-term sustainability. There is an urgent need to carry out detailed investigations on the geographical distribution patterns, habitat utilization patterns, feeding ecology, and impact of herbivores on important plant populations.

Keywords Forests resources · Prospects · Challenges · Jharkhand

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Evaluating Transit-Oriented Development Using a Sustainability Framework: A Case Study of Bhopal

Rupali Khare, Vasanta Govind Kumar Villuri, Devarshi Chaurasia and Supriya Kumari

Abstract Globally, TOD is gaining popularity as an admitted tool to implement Smart Growth and Sustainable Development. TOD includes high density, compact, mixed-use type of development around the transit station, suitable for bicycle and pedestrian users in order to encourage the use of the nonmotorized vehicle and public transit system. The objective of this study was to build up a strategy for measuring the performance of TOD in Bhopal against selected five criteria, including 1. Built environment; 2. Social environment; 3. Travel behavior; 4. Natural environment; 5. Economic Development; and other performance indicators to set up the structure for a database required to attempt performance estimation. And, it evaluates the sustainability of the TOD based on various criteria. Therefore, this study has set up a pattern that future analysis can be measured against.

Keywords Sustainability · Urbanization · Smart growth · Transportation

1 Introduction

As the cities are experiencing rapid growth, the level of urbanization is rising much faster than its total population. Bhopal is competing with the fastest growing city in India. The urban population of Bhopal was nearly 1.79 million (2011) and will reach 3.5 million in 2030 [1]. Urbanization has led to the horizontal growth of cities

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Impact of anthropogenic activities on groundwater quality and quantity in Raipur City, Chhattisgarh, India

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Abstract. In the present study area, anthropogenic activities such as overexploitation of groundwater, improper disposal of Municipal Solid Waste (MSW), rapid industrialization, urbanization, and chemical fertilizer use are led to groundwater resource to depletion and quality degradation. Due to the imbalance between demand and availability, management approaches groundwater quality and quantity adversely affected. To assess the effects of LULC change in groundwater quality, Nitrate was considered. Land use Land cover (LULC) map of 1999 and 2016 and groundwater quality data of 1999 and 2016 revealed that groundwater quality is highly affected in the settlement area due to anthropogenic activities. There is no earmarked site in the Raipur city for the dumping of Municipal Solid Waste (MSW). Hence, to minimize the existing groundwater problem, there is a need to adopt proper remedial measures to improve groundwater quality and quantity.

Keywords: Anthropogenic activity, groundwater quality, Raipur city, groundwater pollution.

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SPATIO- TEMPORAL ANALYSIS OF TURBIDITY IN GANGA RIVER IN PATNA, BIHAR USING SENTINEL-2 SATELLITE DATA LINKED WITH COVID-19 PANDEMIC

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ABSTRACT

Ganga River's water quality has been improved during COVID-19 lockdowns in India (24th March to 18th May, 2020) while comparing with the normal days. This study attempted to highlight the variation in river's water quality in terms of spatio temporal turbidity. This study is based on the analysis of remote sensing. Red band known as the most sensitive to estimate turbidity. The temporal variation in turbidity was also investigated through linear regression model using Sentinel-2A, B optical satellite data. It was observed that before lockdown period as on 3rd March 2020, mean turbidity was estimated as 13.47 FTU (Formazine Turbidity Unit) and during as on 2nd April 2020, estimated as 11.74 FTU. Further, on 17th April 2020, it was increased with 0.25 and estimated as 11.99 FTU. Hence, it can be concluded that due to less anthropogenic activity led by the lockdown imposed in the country, water quality of the river is improving continuously. The study also exhibited the relevancy of remote sensing approach to make qualitative estimates on turbidity, when there are no field observations.

Index Terms— Turbidity, COVID-19, Total Suspended Solid, Sentinel 2, Ganga river, Water quality, Formazine Turbidity Unit

1. INTRODUCTION

In the last few decades, inland water quality mapping is being carried out using remote sensing-based satellite data [1]–[3]. Each feature on the earth's surface acts uniquely while interacting with electromagnetic radiation (EMR). However, these features are recognized based on their spectral response in the satellite images. The spectral properties of these features change with the change in their composition. Likewise, several factors influence the water's spectral response, namely atmospheric constituents' concentration, suspended matter, sun-elevation angle, time of the year, submerged vegetation, emerged vegetation, water roughness, turbidity, and water depth [4]. Several researches exhibited that optical properties of the water are being affected by its quality parameters. Furthermore, there are some constrains to estimate turbidity, colored dissolved organic matter concentration, and chlorophyll concentration etc. [1], [2], [4]–[8].

Turbidity acts as an essential water quality parameter and a substitute for water clarity. Amongst all the parameters for water quality, suspended deposits are the prevalent obstacle in inland waters including lakes, river streams, and inlets [6], [7], [9]. The suspended particles provide the light needed for marine survival [3], [6] and acts as an eutrophication indicator [10], [11].

The novel Coronavirus (SARS COVID-19) left very severe impacts on humanity race and proved as disastrous one. It has affected more than 210 countries in the world and WHO (World Health Organization) declared it pandemic. To restrict the easy spread of virus, India has called the longest and complete lockdowns in three phases from 25 March 2020–14 April 2020 (Phase-1) and 15 April 2020– 03 May 2020 [12] (Phase-II), and 04 May–18 May (Phase-III). Several studies reported, during lockdown period water quality has been improved in terms of turbidity due to less discharge of the industrial pollutants [13], [14]. In this study an initiative has been taken to verify the changes in turbidity based on remote sensing satellite data near Patna city. Spatio-temporal Seninel-2A/2B satellite data has been used to estimate turbidity during pre, during and post lockdown period in the month of March and April

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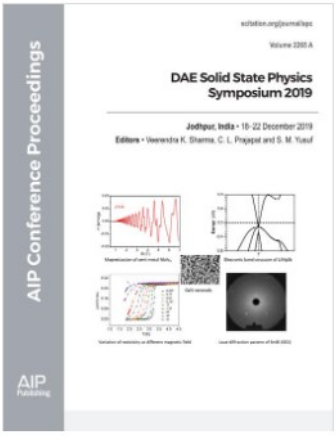

DAE SOLID STATE PHYSICS SYMPOSIUM 2019
18–22 December 2019
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RESEARCH ARTICLE | NOVEMBER 05 2020

Growth of SiO_2 microparticles by using modified Stöber method: Effect of ammonia solution concentration and TEOS concentration

Shrestha Bhattacharya; Aishik Basu Mallick; Mrinal Dutta; Sanjay K. Srivastava; P. Prathap; C. M. S. Rauthan

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The unique structural features and suitability of the SiO_2 microparticles in different application areas have mobilized a worldwide interest in the last few decades. In this report a classical method known as the Stöber method has been used to synthesize silica microspheres. These microparticles have been synthesized by the reaction of tetraethyl orthosilicate ($Si(OC_2H_5)_4$, TEOS)(silica precursor) with water in an alcoholic medium (e.g. ethanol) in the presence of KCl electrolyte and ammonia as a catalyst. It has been observed that the size of the microparticles closely depends on the amount of the TEOS and ammonia. A decrease in the size of micro particles from 2.1μm to 1.7μm has been confirmed as the amount of TEOS increases from 3.5ml to 6.4ml respectively. In similar way a decrease in the diameter of the micro particles from 2.1μm to 1.7μm has been observed with increase in the ammonia content from 3ml to 9ml.

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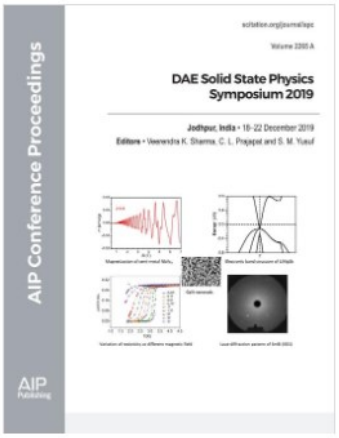

DAE SOLID STATE PHYSICS SYMPOSIUM 2019
18–22 December 2019
Jodhpur, India

RESEARCH ARTICLE | NOVEMBER 05 2020

Tailoring of thermoelectric properties in Bi_2Te_3 by varying the sintering temperature

Arpan Tewary; Ranu Bhatt; Ajay Singh; Shovit Bhattacharya; Pramod Bhatt; Purushottam Jha; Ranita Basu; Pritam Sarkar; K. P. Muthe

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Bismuth Telluride (Bi_2Te3) nanocrystalline material was synthesized using high energy planetary ball-mill at 600 RPM. The Reitveld refined X-ray diffraction pattern of the powder samples confirms the formation of pure Bi_2Te3 phase with the particle size of~58nm. The effect of sintering temperature on the thermoelectric property of the ball-mill sample was studied by sintering the material at 450°C and 550°C. The thermoelectric properties of the sintered pellets were measured in the temperature range of 30-350°C using various characterization techniques. The samples exhibit maximum power factor value of 3mW/m-K and 2.4mW/m-K for the sintering temperature of 450°C and 550°C, respectively. We achieved maximum figure-of-merit (*ZT*) of 0.8 at 350°C in case of sample sintered at 450°C which is attributed to the better power factor value in this sample.

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Study of electrostatic actuated MEMS biaxial scanning micro-mirror with comb structure

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MEMS based actuator and scanning mirrors are device that steers and reflects incident light by angular rotation of the mirror itself. For single axis scanning, the mirror itself provides the required angular rotation, while most of the biaxial scanning micro mirrors have a gimbal configuration. Electrostatic actuation is commonly being used because of ease of fabrication and work on the principle of electrostatic forces between pairs of movable and fixed electrodes. Parallel plate type tip-tilt/scanning mirror is commonly being used for smaller mirror dimensions (up to 2mm). For larger mirror diameter (>2mm), the desired scan angle leads to large gap between the electrodes, which

Urban Surface Simulation Through Image-to-Image Translation Deep Learning Algorithm using Optical Aerial Imagery

Publisher: IEEE

Soumya K Das ; Prakash PS ; A C Pandey ; Bharath H A **All Authors**

Abstract:
Digital Surface Model (DSM) provides the detailed structure and geometry of an urban environment. This paper proposes an approach of using a type of image-to-image translation deep learning model called cycle consistent adversarial networks for reconstructing DSM from monocular aerial imagery. The cycleGAN architecture consisted of two generators with an encoder-decoder network with skip connections and two discriminators that punishes structures at the scale of patches. The cycleGAN objective function was adapted for training on paired images. The evaluation was performed using mean square error (MSE) and zero normalized cross-correlation (ZNCC) for errors in reconstruction. cGAN model was considered as a baseline model for comparison of the proposed approach. The results using the proposed approach confirmed a higher reconstruction accuracy than previous studies that utilized conditional GAN.

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Effect of Glass Fibres on the Strength and Deformation Performance of a Cohesive Soil

Suchit Kumar Patel and Baleshwar Singh

Abstract In this study, the influence of glass fibre reinforcement on the strength and deformation performance of a cohesive soil is investigated by conducting a series of consolidated undrained triaxial tests. The specimens were reinforced with 10 mm fibres of four different contents. Test result shows that the glass fibres have significantly improved the stress–strain, shear strength, secant modulus and energy absorption capability (*EAC*) which further increases with increasing confining pressure. With increasing fibre content, the positive pore pressure development increases and bulging of specimen decreases. Contribution of fibres in deviator strength ratio (*DSR*) is higher at low confining pressure and decreases with increasing confining pressure. However, the fibre contribution on secant modulus and *EAC* increases with increasing confining pressure. Both cohesion and friction angle have increased with fibre content and the maximum fibre contribution is found with 0.75% fibres. The glass fibre-reinforced cohesive soil has ample scope for various geotechnical applications.

Keywords Glass fibre · Cohesive soil · Shear strength · Secant modulus

1 Introduction

Among the several techniques used to improve the shear strength of soil, the soil reinforcement method is getting the favour of the practicing engineers, primarily due to their simplicity, ease of construction and overall economy. Other than conventional method of reinforcement where planner reinforcement of synthetic materials in the form of geogrid, geotextile, geocomposite is being used, soils can also be reinforced with discrete fibres called fibre-reinforced soil. In fibre-reinforced soil, fibres of the

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ccaROS: A ROS Node for Cognitive Collaborative Architecture for an Intelligent Wheelchair

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Abstract. For effective Human-Robot Interaction (HRI), an intelligent wheelchair (IW) need to be cognitively enhanced. Robot Operating System (ROS) has been steadily gaining popularity among robotics researchers as an open source framework for robot control. This paper presents ccaROS - a new ROS node for a Cognitive Collaborative Architecture to achieve better HRI for an IW. The design of the ROS node is presented. It provides mechanisms for obstacle avoidance, detection and adaption of user's navigational strategy; seamless switching of driving control from machine to human and vice-versa. This would not only assist to achieve safe navigation but also allow retention of residual skills of the user. The effectiveness of ccaROS has been evaluated through simulation studies within a ROS-USARSim environment.

Keywords: Intelligent wheelchair · ROS node · Cognitive Collaborative Architecture

1 Introduction

For people who suffer from mobility impairment, intelligent wheelchairs (IWs) are a sought-after solution. However, users of IWs often struggle to drive safely and effectively; resulting in the loss of their residual skills. Several prototypes have been developed and control algorithms proposed to assist users drive safely [4,7]. Nevertheless, more often than not, the user is relegated to being a *rider* rather than taking advantage of the user's potential; exceptions being [3,12]. IWs must interact with the human as a team-mate! Cognitive embodiment through cognitive architectures enable better Human Robot Interaction (HRI) [6,10]. For retention of residual skills, the user must be provided assistance-as-required; cognitive architecture has been proposed to provide help-if-needed [8].

Cognitive Collaborative Architecture (CCA) [8] is inspired from [10,11] and is an adaption of ACT-R [1]. Figure 1 shows the CCA. The architecture incorporates three layers: a. user interface layer - provide the interface between user

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Analysis of Factors of Milk Production and Use of ICT in Diary: India Versus Jharkhand

Pradeep Kumar Hazari, Pranab Kumar, AmarNath Jha and Nitesh Bhatia

Abstract This paper is intended to bring the status of milk production in Jharkhand in respect of India and the importance of ICT in Indian dairy. In general thought process, it is believed that number of animals is the major function of milk production; however, reality is something else. This paper tried to reveal the relationship of production factor of milk. There are various fundamental factors which are crucial for milk production in India as well as in Jharkhand. However, this paper only talks about animal population and productivity of animal as factors of milk production. Jharkhand milk production is very less compared to many states of India. This paper also tries to identify the other reasons behind low production of milk in Jharkhand, and finally, certain measures have been suggested to improve milk production in Jharkhand and lack of ICT use in Indian dairy.

Keywords Bovine · Cattle · Dairy · Milk · ICT in dairy

1 Introduction

India is the largest producer of milk in the world, with production of 159.12 million tons (January to December) during 2017–2018 and is growing at the rate of 4% CAGR in the last 3 years and contributes approximately 20% of total world milk production and produces both cow and buffalo milk [1], whereas other major milk-producing countries produce cow milk. Jharkhand milk production is approximately

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Heuristic Approach for Finding Threshold Value in Image Segmentation

Sandip Mal and Ashiwani Kumar

Abstract Image segmentation is a major challenge in the field of image processing. Proper segmentation of medical image is difficult because of the size and position of the inhomogeneity in the tissues, blood flow and similar contrast to the wall. Thus, an automated approach is required to develop proper segmentation of the region of interest (ROI). This paper describes a *Heuristic Image Segmentation Algorithm* based on genetic algorithm optimization. OTSU algorithm is used for optimization. Threshold value of proposed method can be used for finding the ROI. A comparison has been made with other thresholding algorithms for supporting the better results.

Keywords Image segmentation · Medical images · Feature extraction · Heuristic · Genetic · Optimization · Static · Dynamic · OTSU

1 Introduction

Segmentation process of a digital image separates the image into multiple segments, i.e., the set of pixels [1, 2]. The main objective of segmentation is to set up the representation of an image into a more meaningful way for easy analysis. Image segmentation is generally applied to identify the region of interest, objects, and boundaries like lines, curves, corners, etc. of an image. In another way, this process allocates some label to each pixel of an image. Research on medical images is most important now a day for assisting health care and allows health care to provide a better diagnosis. Therefore, medical images segmentation is a challenging part of Medical Image Analysis. The segmentation of medical images requires different algorithms and different procedure to segment and classify of an image [7–10]. For a given set of goal, heuristic approach is useful to get a guaranteed optimal solution but have some

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Vivek Kumar
Ram Prasad
Manoj Kumar *Editors*

Rhizobiont in Bioremediation of Hazardous Waste

Springer

11

Spinel Ferrite Magnetic Nanoparticles

An Alternative for Wastewater Treatment

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11.1 Introduction

In the present scenario, water pollution caused by domestic, industrial, commercial, and agricultural activities has emerged as one of the major environmental challenges in both developed and developing countries. The consumption of available freshwater is almost 70%, 22%, and 8% in agricultural, industrial, and domestic sectors, respectively. The current trend of a growing population might lead to an acute shortage of water and it is anticipated that by the end of 2027, around four billion people will encounter the problem of clean drinking water due to groundwater depletion and water pollution (Nemerow and Dasgupta 1991; Helmer and Hespanhol 1997; Lehr and DeMarre 1980; Ali and Aboul-Enein 2004; Murray et al. 2015). Freshwater is essential for the survival of life. River and water resource contamination around the world is directly increasing due to rapid expansion in population and urbanization, as well as the rapid pace of industrialization leading to direct disposal of untreated noxious industrial waste, sanitary waste, and excess from agricultural fields. The scarcity of freshwater and its treatment cost impose paying for clean water and water tariffs in developing countries (Nemerrow 1978; Forgacs et al. 2004). Wastewater contains several pollutants such as biological pollutants, undesirable inorganic and organic chemicals that include heavy metal ions, dyes, and medication waste, which makes water unsafe for drinking purposes. Treatment of this contaminated water is a large challenge at present (Rai et al. 2005; Reddy and Yun 2016; Santhosh et al. 2016). These pollutants are not only harmful to living beings but also directly affect the ecosystem. Hence, removing these kinds of pollutants completely from wastewater or to reduce it to below a certain level as per World Health Organization (WHO) guidelines is an urgent need to ensure human health and environmental safety. Considering these hazardous effects,

Pollutants and Water Management: Resources, Strategies and Scarcity, First Edition. Edited by Pardeep Singh, Rishikesh Singh, Vipin Kumar Singh, and Rahul Bhadouria.

Biosorption for Wastewater Contaminants

Chapter 12

Deployment of Used Biosorbents in Environmental Remediation

Prospects and Challenges

Shashikant Shivaji Vhatkar, Guru Charan Sahu, Ramesh Oraon

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Summary

Inefficient waste management has led to the contamination degradation of various ecological resources. Several physicochemical techniques are already in place to remediate this issue. However, remediation through adsorption presents several advantages over existing physicochemical techniques in terms of cost-effectiveness. Furthermore, biosorbents present the additional advantage of sustainability and offer remediation of affected natural resources. This chapter presents an overview of the deployment of biosorbents and their potential in conserving natural resources. This chapter also highlights the recovery of metals through used biosorbents. Finally, the chapter discusses current challenges in the implementation of biosorbents.

References

Aftab , K. , Akhtar , K. , Kausar , A. et al. (2017). Fungal strains isolation, identification and application for the recovery of Zn(II) ions . *J Photochem Photobiol B Biol* **175** : 282 – 290 . doi: 10.1016/j.jphotobiol.2017.08.028 .

CAS | PubMed | Web of Science® | Google Scholar

Aguirre-Araque , J.S. , Guimaraes , R.R. , and Toma , H.E. (2020). Chemistry of ternary monocarboxyterpyridine-bipyridine-trimercaptotriazine ruthenium complexes and application in dye sensitized solar cells . *Polyhedron* **182** : 114513 . doi: 10.1016/j.poly.2020.114513 .

Chapter 2

Sustainable Land Resource Management Approach and Technological Interventions – Role of GI Science

Sandeep K. Pandey, Ritambhara K. Upadhyay, Chintan Pathak, Chandra Shekhar Dwivedi

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Summary

Land resources are renewable, have a vast extent, and provide ground for all developmental activities. Land resource management requires details about landforms (like plains, hills, plateaus, etc.). The land resource planners need a synoptic view of land resources to plan optimally. Unplanned urbanization, modern agricultural practices, unsustainable uses of natural resources, and climate change are the leading causes of land degradation. Globally around 12 million hectares of land degrades annually. Approximately a hundred million hectares of land is non-arable in India. In COP-14, India committed to turning 26 million hectares of land into the arable category. The possible intervention areas to succeed are smart funding machinery, geospatial technology, private sector involvement, and diverting the funds to strengthen natural resources' replenishment capabilities to achieve SDG 15.3 agenda point.

Chapter 12

Effects of Acid Mine Drainage on Hydrochemical Properties of Groundwater and Possible Remediation

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Book Editor(s):Sughosh Madhav, Pardeep Singh

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Summary

Acid Mine Drainage (AMD) is a severe environmental problem in the area of metal and mining industries throughout the world. AMD becomes a pollutant for the surface and groundwater due to its highly acidic nature and high toxicity. From mineral exploration to the closing stage, mining methods, both opencast as well as underground, have serious environmental impacts with large-scale consequences. Sulphide minerals, mainly pyrite, present in coals when exposed to air and water and get oxidized and hydrolyzed to form sulphuric acid, which further dissolves heavy metals. Formation of AMD is a natural process but it is accelerated by large-scale indiscriminate, unscientific mining and

Chapter 10
An Integration of Keyless Encryption, Steganography, and Artificial Intelligence for the Secure Transmission of Stego Images

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ABSTRACT

Protected stored data as well as transfer in this virtual environment have been a significant thing since this world wide web has been used for information exchange. The need for data security rises as the level of personal data exchanged on the web is becoming more susceptible. To protect information from malicious use as well as alteration, services like confidential information but also data integrity have been needed. So many traditional cryptographic methods have been proposed by numerous studies throughout

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Revisiting Kol Revolt (1831–32)

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Seema Mamta Minz & Prerna Choubey

Abstract

The aboriginal settlers of Jharkhand, called Kol by the Britishers, have a remarkable contribution to the tribal and freedom movements of India. It was in the year 1765 that the grant of the Diwani of Bengal, Bihar and Orissa (now spelt Odisha) was given to the East India Company by the last Mughal emperor, Shah Alam. Consequently, Jharkhand known as Chotanagpur during that period was a part of the Subah of Bihar and naturally came under the control of the British. However, the actual entry of the British in this area commenced from the year 1772, and as a result, the local rajas of Chotanagpur became tributary chiefs of this area. This new and forced setup of political apparatus brought a catastrophic change in the life of its inhabitants, specially, in life of the tribal people. This particular change in the land pattern was preluded without considering the culture of the people, which had different features from Bengal as well. As a matter of fact, a clear dissatisfaction prevailed in and around the Chotanagpur area against the new rule and the colonial rulers. From the last decade of eighteenth century, sporadic unrests were reported all over Chotanagpur. In this context, special mention may be given to the Kol revolt of 1831–32. It can be referred to as the first massive tribal unrest of Jharkhand in view of its

Chapter 12

Biocompatible Cellulose-Based Sorbents for Potential Application in Heavy Metal Ion Removal from Wastewater

Shashikant Shivaji Vhatkar, Kavita Kumari, Ramesh Oraon

Book Editor(s):Pardeep Singh, Rishikesh Singh, Vipin Kumar Singh, Rahul Bhadouria

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Summary

Anthropogenic activities, including industrial activity, unsustainable agricultural practices, and inefficient waste management, have led to the intrusion of toxic heavy metal ions (HMi). This chapter highlights the significant role of cellulose and its derivatives (as biosorbents) toward sorption characteristics in environmental remediation and waste treatment. In view of rapid industrial commercialization coupled with the issue of global warming, cellulose-based sorbents can pave the way for a clean environment and greener eco-systems. In this chapter, sorption efficacy of cellulose-based sorbents has highlighted fundamental and mechanical methods toward HMi removal from wastewater. The chapter provides a basic understanding of cellulose chemistry, functionalization, development, and optimization through analytical parameters. A brief overview on sorption, kinetic studies, and thermodynamics is also discussed.

Chapter 18

Forest Degradation Prevention Through Nature-Based Solutions

An Indian Perspective

Purabi Saikia, Akash Nag, Rima Kumari, Amit Kumar, M.L. Khan

Book Editor(s):Majeti Narasimha Vara Prasad

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Summary

Monitoring forest cover and restoring degraded forests are essential ecological aspects of sustainable development in India's forestry sector. Forest degradation is a natural eco-disaster affecting the economy and ecology at a local and global scale. Factors responsible for the acceleration of forest degradation include population growth, forest land conversion for agriculture, industry, power projects, irrigation, roads, urbanization, private encroachments, and improper forest management. The continuous degradation of natural forests leads to drought, flood, disturbance in nutrient cycling, increasing atmospheric CO_2, soil erosion, and loss of biodiversity. In recent years, a positive forest cover change has been possible by virtue of better conservation and management interventions by the Indian government through afforestation, community participation to protect plantation areas, and expansion of trees outside natural forests. Forest landscape restoration aims to enhance the ecological integrity of deforested or degraded landscapes and improve human well-being using nature-based solutions (NBSs) such as plantation, agroforestry, erosion control, and natural forest regeneration. There are different International and Indian policies formulated to restore degraded forests like Indian Collaborative Forest Landscape Restoration Program with US Forest Service 2009, Bonn Challenge 2011 (www.bonnchallenge.org), Joint Forests Management, etc. This chapter aims to provide an overview of forest degradation through natural and anthropogenic activities and NBSs toward its restoration with particular emphasis on policy aspects in India. The study recommends that forest landscape restoration can be

Chapter 8

Simulation of Charging and Discharging a Thermal Energy Storage System Involving Phase Change Material

S. Sanyal, A. Borgohain, S.P. Gupta

Book Editor(s):Umakanta Sahoo

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Summary

This chapter discusses some of the important aspects involved in the design of a thermal energy storage system and presents numerical study and simulation of melting and solidification of a Phase Change Material (PCM) using ANSYS FLUENT. A 3D simulation model of the experimental set-up is developed which consists of a finned u-tube immersed into a PCM enclosed in a cylindrical shell. Scalable meshes for the whole geometry as well as the one-fourth symmetry sector are generated to simulate the melting and solidification of PCM for two cases of without and with fins attached to the fluid pipe. The assumptions, equations involved in numerical modelling, the software-specifications, and distribution of PCM and fin temperatures and liquid fraction of PCM in various cases are discussed. The numerical model developed in this work can be applied to other similar configurations within the domains of properly defined materials and boundary conditions and can be suitably scaled up for developing a large-scale latent thermal storage system.

Safety and Ethics in Omics Biology

12

Praveen Kumar Sharma, Ashwani K. Rai, and Naveen K. Sharma

Abstract

The recent advances in "omics" technologies have impacted biological science research in many ways. This includes the realm diversity studies, physiological, biochemical, and molecular level researches to the development of breakthrough products and approaches. They are strengthening our attempts to fight with emerging diseases, global food crisis, environmental degradation, production of quality value-added products values, and in better understanding of the underlying mechanism(s) of host–pathogen interactions and stress (both biotic and abiotic) tolerance in plants and microbes. However, many of these techniques are still under refinement and resulting data need careful integration for attending meaningful conclusions. Although not a big concern, but we must be attentive to some of the biosafety measures and ethical concerns associated with these techniques, which we have tried to discuss in this chapter.

Keywords

Bioinformatics · Ethics · Omics · Technologies · Productivity · Safety · Stress tolerance · Sustainability

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Management of Contaminants of Emerging Concern (CEC) in Environment

2021, Pages 357-374

Chapter 13 - Nanoscale Zero Valent Iron (nZVI): A Promising Nanoparticle for Environmental Contamination Remediation

Amal Krishna Saha [a], Shashikant Vhatkar Shivaji [b], Ramesh Oraon [b]

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https://doi.org/10.1016/B978-0-12-822263-8.00013-0

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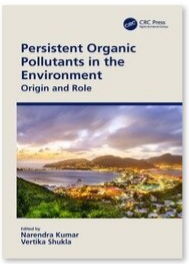
Abstract

This chapter highlights the tremendous future prospects of nanoparticle in diverse physico-chemical treatment methods exercise in wastewater treatment process. The redox activity of nanoscale zero valent metals (nZVM, viz. Fe^0, Zn^0, Sn^0, and Al^0) are well-known and emerged as a prominent group of nanoparticles in environmental contamination remediation. Recent research innovation also demonstrates significant relevance of zerovalent iron (nZVI) for polluted ground and wastewater treatment processes in the context of environmental and technological evolution. Smaller particle size, large surface area, selectivity, and longevity of nZVI results in high reactivity and rapid destruction of hazardous contaminants. nZVI utilizes reductive and oxidative mode for wastewater treatment. While, the reduction process is attributed to the use of nZVI and their enhanced forms through bimetallic associations (mostly with Zn/Mg), on the other hand, the oxidation process is prevalent for advanced oxidation process (AOPs), ozonation and photochemical degradation of contaminants. Hence, nZVI consequently found be periodical for the treatment of different pollutants (like heavy metals, persistent organic contaminants).



Chapter

Causes, Consequences, and Control of Persistent Organic Pollutants

By Ritu Singh, Sanjeev Kumar, Susmita Karmakar, Arif J. Siddiqui, Ankita Mathur, Mohd. Adnan, Vishnu D. Rajput, Anita Rani, Narendra Kumar

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Advances in Remediation Techniques for Polluted Soils and Groundwater

2022, Pages 219-232

Chapter 11 - Assessment of long-term groundwater variation in India using GLDAS reanalysis

Swatantra Kumar Dubey [1], Preet Lal [2], Pandurang Choudhari [3], Aditya Sharma [4], Aditya Kumar Dubey [5]

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Abstract

Groundwater is used to meet the needs of drinking water, industrial applications, and agriculture sectors in various parts of the world and is naturally replenished by the infiltration process during the precipitation. Due to population growth and industrialization, groundwater resources are often overexploited in different parts of the world, leading to rapid declination in the groundwater level. Therefore groundwater fluctuation concerning space and time draws attention across the globe for sustainable water resources management. In the present study, long-term trends and spatiotemporal variation of groundwater were analyzed using the NASA Global Land Data Assimilation System Version 2 data from 2003 to 2019. Seasonal variation of groundwater levels was spatially divided into four seasons, that is, December, January, February; March, April, May; June, July, August; and September, October, November months. The groundwater trend showed very high in the northern and western parts, and it is moderate in the southern part of India. However, the fluctuation is comparatively less in the central part of India due to the replenishment of groundwater by rainfall. The trend analysis highlighted the decreases in the groundwater water, mainly during the monsoon season.

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An Innovative Role of Biofiltration in Wastewater Treatment Plants (WWTPs)

2022, Pages 113-136

Chapter 6 - Recent trends and future perspectives in applications of biofiltration

Ananya Naha [a], Swastika Saha [a], Hare Ram Singh [a], Sushil Kumar Shukla [b], Vinod Kumar Tripathi [c], Santosh Kumar Jha [a]

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Abstract

The rapidly increasing industrialization has adversely affected the environment due to deterioration of water and air quality. The continuous addition of hazardous chemicals, gaseous contaminants, and particulate materials to our environment imposed the life-threatening challenges for flora and fauna. There is an urgent need to adopt the sustainable technologies to reduce the contamination occurring in air and water resources. To cope up with various types of contaminants abatement techniques have been employed. In the recent decade the biofiltration-based methods have been emerged as promising abatement techniques to remove the hazardous contaminants from wastewater or polluted air. The biofiltration exploits the potentials of microbial systems (bacteria and fungi) to degrade the wide range of chemicals and volatile organic components (VOCs). In this chapter emphasis has been given on the basic concepts and mechanism of biofiltration along with its application for treatment of wastewater and polluted air. The details about the removals of hazardous heavy metals, cationic-anionic dyes, xenobiotics, organic contaminants, and assimilable organic carbon from water has been discussed. The removal of VOC, malodorous compounds, and sulfurous compound from air have been discussed. The chapter also gives the light about pros and cons of biofiltration.

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Fungi Bio-Prospects in Sustainable Agriculture, Environment and Nano-technology

Volume 3: Fungal metabolites and Nano-technology

2021, Pages 489-513

Chapter 15 - Role of fungal endophytes in the green synthesis of nanoparticles and the mechanism

Modhurima Misra [1], Ashish Sachan [2], Shashwati Ghosh Sachan [1]

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Abstract

In recent times, with the help of nanotechnology, it has been possible to tailor and fabricate the structures of large materials at extremely small scales to achieve specific properties, quite different from either their fine particles or bulk counterparts. Nanoparticles have profound applications in medicine in nanosensors, cell imaging, drug delivery, environmental remediation, etc. Although they have been successfully synthesized using different physical and chemical methods, their obvious disadvantages have led the researchers to focus more on the synthesis of bionanoparticles. Fungal systems have attracted much attention in this regard, as they are ecofriendly, biodegradable, easy to culture and scale up, with a high wall binding capacity. Moreover they have quite high metal bioaccumulation capacity and are effective secretors of extra- and intracellular enzymes which help in the formation of different metal nanoparticles. The mechanism of synthesis, characterization, and applications of mycogenic nanoparticles make this a fairly new and exciting area of research with considerable potential for further development.

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Contamination of Water

Health Risk Assessment and Treatment Strategies

2021, Pages 559-573

Chapter 38 - Magnetically separable graphene oxide-based spinel ferrite nanocomposite for water remediation

Sanjeet Kumar Paswan [1], Rajnish Kumar [2], Pawan Kumar [3], Ram Kishore Singh [1], Ashish Kumar [4], Sushil Kumar Shukla [5], Lawrence Kumar [1]

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https://doi.org/10.1016/B978-0-12-824058-8.00004-9 ↗

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Abstract

In the present time, water pollution has become a serious global concern affecting our eco-system. Compared to traditional methodology, nanotechnology has emerged as a promising technique where it has contributed novel nanomaterials for the treatment of wastewater. The graphene oxide-based spinel ferrite (GOSF) nanocomposite is a novel functional material which has high pollutant removal capacity along with unique characteristics like excellent large specific surface area, easy functionalization, magnetic characteristics, tunable shape and size, high chemical stability, rapid adsorption kinetics, surface active sites, excellent photocatalytic behavior, proper structural order, low electronic bandgap, and less energy requirements and time in the treatment. In addition, due to its magnetic properties, it can easily be recovered after removal of contaminants by the application of an external magnetic field and then reused. The outstanding properties of GOSF nanocomposite may provide revolutionizing tools for water remediation.

Microbial Ecology of Wastewater Treatment Plants

2021, Pages 175-192

Chapter 8 - Biological wastewater treatment technology: Advancement and drawbacks

Ahmed Hussain [a], Rekha Kumari [a], Shashwati Ghosh Sachan [a], Ashish Sachan [b]

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Abstract

Biological wastewater treatment is a modern technique in which wastewater is treated with microorganisms instead of chemicals. In this way, we try to prevent the adverse effects caused by chemical treatment of wastewater such as chemical accumulation in water bodies or algal blooming. In biological wastewater treatment, many aerobic as well as anaerobic microorganisms can be used in various methods to reduce different types of pollutants present in water and to reduce biochemical oxygen demand of water. Activated sludge is also a very important part of the biological treatment of wastewater as it is used as inoculum to start the microbial reactions in wastewater treatment plants. Various techniques of biological wastewater treatment can be used to remove a variety of pollutants from wastewater such as conventional activated sludge process, membrane bioreactors, or trickling filter process. Biological wastewater treatment is a slow process and requires a large area to treat and store water, which leads to high capital and operating cost. Biological wastewater treatment produces some unwanted microorganisms that produce gases and bad odor. This treated effluents containing water cannot be released into water bodies as it can cause a change in physicochemical properties of water, which ultimately leads to a decrease in the aquatic animal population. Biological treatment of wastewater eliminates organic pollutants but not all types of pollutants such as detergents, cosmetic wastes, etc. This chapter provides an

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Contamination of Water

Health Risk Assessment and Treatment Strategies

2021, Pages 417-429

Chapter 28 - Inorganic nanotubes for water treatment through adsorption and photocatalytic degradation

Amal Krishna Saha [1], Shashikant Shivaji Vhatkar [2], Ramesh Oraon [2]

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https://doi.org/10.1016/B978-0-12-824058-8.00025-6 ↗

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Abstract

Presently, a demand-based economy and unattended environmental concerns like contaminants in water and their removal have gained upraised attention worldwide. Though many traditional techniques are in place to encounter this issue, their incapacity to address molecular contaminants, has led researchers to prefer nanotechnology applications. Recently, inorganic nanotubes (INTs) have been gaining interest due to their morphological uniformity and physico-chemical attributes. INTs are cylindrical molecules often composed of 2D layered material (like transition metal oxides, sulfides, selenides etc.). Unique optical, electrical, thermal, mechanical, and electromechanical properties delineate INTs from their bulk counterparts and also from carbon nanotubes like analogs. Additionally, a high specific surface area, surface area to volume ratio, exciting capillarity and wetting phenomena with water ensures promising applications in adsorption technology. This chapter will impress upon various INT in adsorption systems through functionality and their analogs for wastewater treatment. Furthermore, mechanism and kinetics of photocatalytic degradation by INTs has also been discussed briefly.

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Sustainable Environmental Clean-up

Green Remediation

2021, Pages 231-251

Chapter 11 - Nanotechnology-based filtration membranes for removal of pollutants from drinking water

Lawrence Kumar [a], Sanjeet Kumar Paswan [a], Pawan Kumar [b], Ram Kishore Singh [a], Rajnish Kumar [c], Sushil Kumar Shukla [d]

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Abstract

The rapid increase in global population, urbanization, and industrialization has limited the resource of clean drinking water, significantly highlighting the importance of water purification technologies across the world. The conventional methods employed in water purification require chemicals and infrastructure that make them troublesome, costly, time-consuming, and not eco-friendly. Hence, the requirements for drinking water to be produced in safe, cost-effective and energy-efficient manners call for sustainably developed new and innovative techniques. Nanotechnology has emerged as an efficient and cost-effective long-term solution through the adaption of advanced filtration membranes. They are composed of various nanomaterials, such as carbonaceous nanomaterials, metal oxide nanoparticles, zeolites, and so forth, incorporated into a polymeric matrix that enhances the performance of conventional polymeric membranes. It has remarkably improved thermal and mechanical traits, water permeability, antifouling property, and solute selectivity, with low energy consumption and more cost-effectiveness than conventional polymeric filtration membranes. This extensive literature review demonstrates the excellent performance of nanomaterial-based membranes as compared to traditional forms. Donnan, transport, dielectric, and steric effects play

An Integration of Phycoremediation Processes in Wastewater Treatment

2022, Pages 337-358

Chapter 16 - Bioactive compounds from microalgae

Swastika Saha [a], Sushil K. Shukla [b], Hare R. Singh [a], Bhaskar Singh [c], Santosh K. Jha [a]

https://doi.org/10.1016/B978-0-12-823499-0.00005-5

Abstract

Microalgae belongs to morphologically and biochemically diverse group of microorganisms dwelling in freshwater and marine water ecosystem. The scientific community worldwide has explored the potential of microalgae to produce medically and commercially promising bioactive compounds. The bioactive compounds derived from microalgae include phycobiliprotein, proteins, peptides, fatty acids, chlorophylls, carotenoids, and vitamins having promising application in pharmaceutics, food additives, cosmetics, biofuels, etc. The proposed chapter emphasize on the diverse group of microalgae and the bioactives derived from them. The application of these bioactives along with their bioseparation process have been discussed. We have also discussed the metabolic pathways involved in synthesis of bioactives in microalgae. Microalgae-derived bioactives have promising market potential.

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Water Conservation in the Era of Global Climate Change

2021, Pages 213-228

Chapter 10 - Climate change: impact on waterborne infectious diseases

Rehab A. Rayan [1], Moharana Choudhury [2], Mitrajit Deb [3], Arghya Chakravorty [4], Rinku Moni Devi [5], Jyoti Mehta [6]

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Abstract

There's a growing concern in the influence of climate change with temperatures worldwide affecting public health and well-being. Over 50 years of aggregated research data show that human activities mainly led to global warming caused via the greenhouse effect of the high carbon dioxide (CO_2) in the air. Such impact rises in the ambient temperature and creates massive climatic disruptions like eroding land from raised sea levels because of the melting of the Antarctic and Arctic ice, droughts, spike the extent of storms and hurricanes, and floods in several regions. Universally, such unfavorable outcomes have ongoing damaging influences on almost all nations, however higher on low-middle-income countries, with adverse effects on sustainability and development, including the health and well-being of millions of individuals. Lately, the effect of climate change on waterborne infectious diseases has become clearer. Intense climatic events like storms might contaminate the recreational coastline waters, raising the danger of diarrhea and other waterborne infectious diseases. Polluting drinking water is an obvious reason for transmitting waterborne infectious diseases in intense water-associated climatic conditions. The plant system for treating water might become diminished because of massive rains. Climatic events affect insect vectors' life cycle by influencing the reproduction and survival rates, habitat, prosperity, and transmission; similarly, it

GPS and GNSS Technology in Geosciences
2021, Pages 3-20

Chapter 1 - Introduction to GPS/GNSS technology

Amit Kumar [1], Shubham Kumar [1], Preet Lal [1], Purabi Saikia [2], Prashant K. Srivastava [3 4], George P. Petropoulos [5 6]

https://doi.org/10.1016/B978-0-12-818617-6.00001-9 ↗

Abstract

Satellite-based navigation systems are one of the most indispensable technologies in the present-day world that have made a vast improvement since the day of its inception due to global availability of signal and performance. It allows measuring positions in real time with an accuracy of up to a few centimeters on the Earth. The advent of Global Positioning System (GPS) has led to technological revolutions in highly accurate navigation, positioning, and time that is being applied in various civilian, military, and scientific purposes. GPS works on the radio waves that are being transmitted from a space-based group of satellites to the terrestrial GPS receiver to deduce the exact position of the Earth. Although there are various errors related to clock errors, multipath error, receiver noise, and antenna phase center variations at satellite as well as receivers end, it is being resolved through technological advancement and methods. Incorporating both GPS and GLONASS constellations in the navigation system may significantly improve the accuracy of the navigational solution. This chapter aims to discuss the various concepts of GPS, including working principle, various errors, various Global Navigation Satellite System technologies evolving from GPS to Quasi-Zenith Satellite System, and its vivid applications.

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Wastewater Treatment

Cutting Edge Molecular Tools, Techniques and Applied Aspects

2021, Pages 55-65

Chapter 3 - Molecular Tools for Microbial Diversity Analysis

Prashant Kumar [1], Archana Singh [1], Ashish Sachan [2], Shashwati Ghosh Sachan [1]

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https://doi.org/10.1016/B978-0-12-821881-5.00003-9 ↗

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Abstract

The biosphere is inhabited by various microbes with unique abilities to survive in many diversified habitats. These microbes can be utilized for production of many economically beneficial products and can be exploited for innumerable bioprocesses such as enzyme production, agricultural, pharmaceutical, and industrial processes. There are very limited data regarding many microbial communities in several ecosystems because of their limitation to be cultured and isolated. The traditional methods that try to represent microbial communities on the basis of nutritional and morphological characteristics lack information regarding evolutionary history and taxonomic order. The modern molecular tools for the analysis of microbial diversity can solve the shortcomings of traditional methods and can establish a phylogenetic lineage and determine their taxonomic order.

This chapter focuses on various molecular tools such as 16S rDNA sequencing, restriction fragment length polymorphism, denaturing gradient gel electrophoresis/temperature gradient gel electrophoresis, and DNA-DNA hybridization for the identification and analysis of microbial communities.

Chapter 12
Methodology to Predict Emissions and Performance Parameters of a Methanol Fueled Diesel Engine

G. K. Prashant, D. B. Lata, and M. Ravi Shankar

Abstract A response surface methodology of the experimental investigations for varying substitution and load conditions has been performed on a 4-cylinder (turbocharged and intercooled) 62.5-kW gen-set dual fuel diesel engine. Break thermal efficiency, oxides of nitrogen, unburned hydrocarbon, and carbon monoxide were considered with the response surface model. Response surface models developed were used to relate the parameters of liquid fuel substitution and varying loads with the output parameters. Analysis of variance of the experimental results gave 95% and above in mostly all cases and justifies the models applied with those of the experimental results. Comparisons have been discussed elaborately.

Keywords Oxygenated compound · Response surface method · Dual fuel

12.1 Introduction

The robustness, reliability, and capability of the diesel engine and higher torque production at lower speeds have led to its growth in the automobile sector. In the recent times, there has been a steady increase in diesel engines due to increase in their efficiency and improved fuel consumption. They are used in transportation (roads and railways), industries, farming, electrical power generators, and construction equipment and are the foremost cause of air pollution. For the new generation of diesel engines, rigid standards have been imposed and as a result the automobile industry is struggling to keep up with the regulations. An increase in emissions and the introduction of the emission norms due to climatic changes have led to the conservation of energy and diversification of sources of energy (Swift and Foster 1999). Researchers

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