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Fractional Models by Using Adomian Decomposition Method with Mahgoub Transformation



Yogesh Khantwal, Gajendra Kumar Mishra and Barkha Chaudhary

Abstract Through this communication, the huge system Adomian Decomposition Technique (ADT) is joined with Mahgoub Transformation (MT) to obtain a huge rough expository arrangement of fragmentary models. The fragmentary subordinates are acknowledging in caputo sense. The new structure is known as Adomian Decomposition Mahgoub Transformation Technique (ADM-TT). To depict the unwavering quality of ADM-TT a few applications are stated.

Keywords Variable transformation, Adomian decomposition method, Fokker-Planck equality, Schrödinger equation.

1 Introduction

Fractional analytics is a part of scientific examination that reviews the few unique potential outcomes of characterizing genuine number forces or complex number forces of the separation administrator. Fragmentary math is a speculation of common separation and mix to self-assertive request. In factual mechanics, the Fokker-Planck Equality is a fractional differential equality that portrays the time advancement of the likelihood thickness capacity of the speed of a molecule affected by drag powers and arbitrary powers, as in Brownian movement. The equality can be summed up to different observables as well. It is named after Adriaan Fokker and Max Planck [1, 2] and is otherwise called the Kolmogorov forward equality, after Andrey Kolmogorov, who freely found the idea in 1931 [3]. The main steady infinitesimal determination of the Fokker-Planck equality in the single plan of established and quantum mechanics was performed by Nikolay Bogoliubov and Nikolay Krylov [4].

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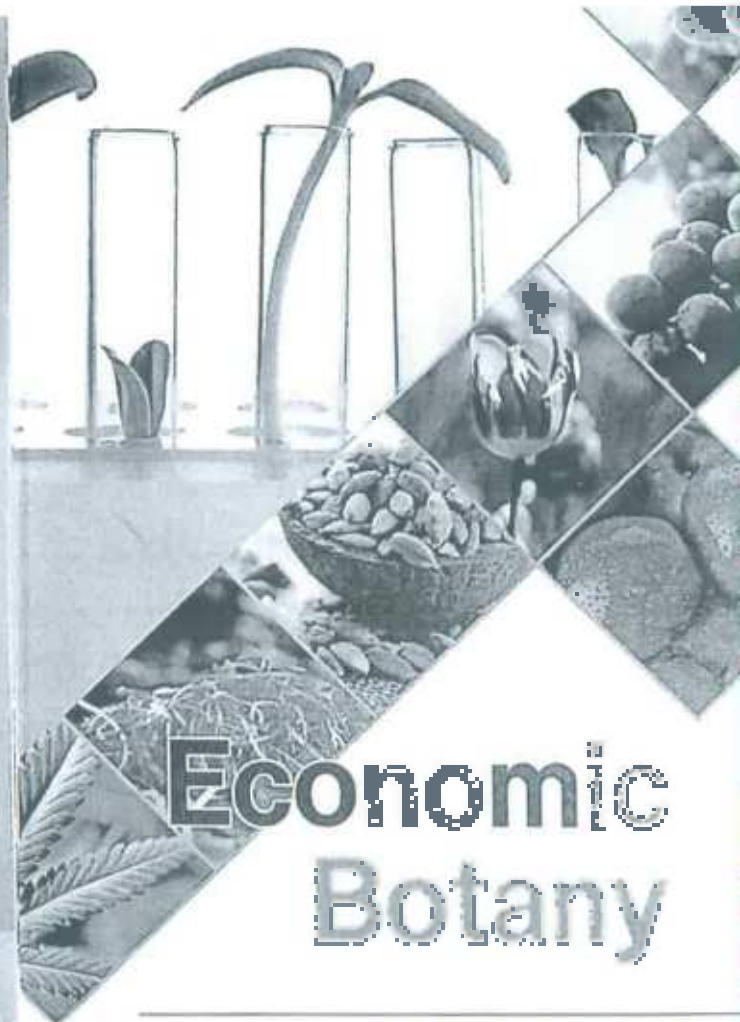
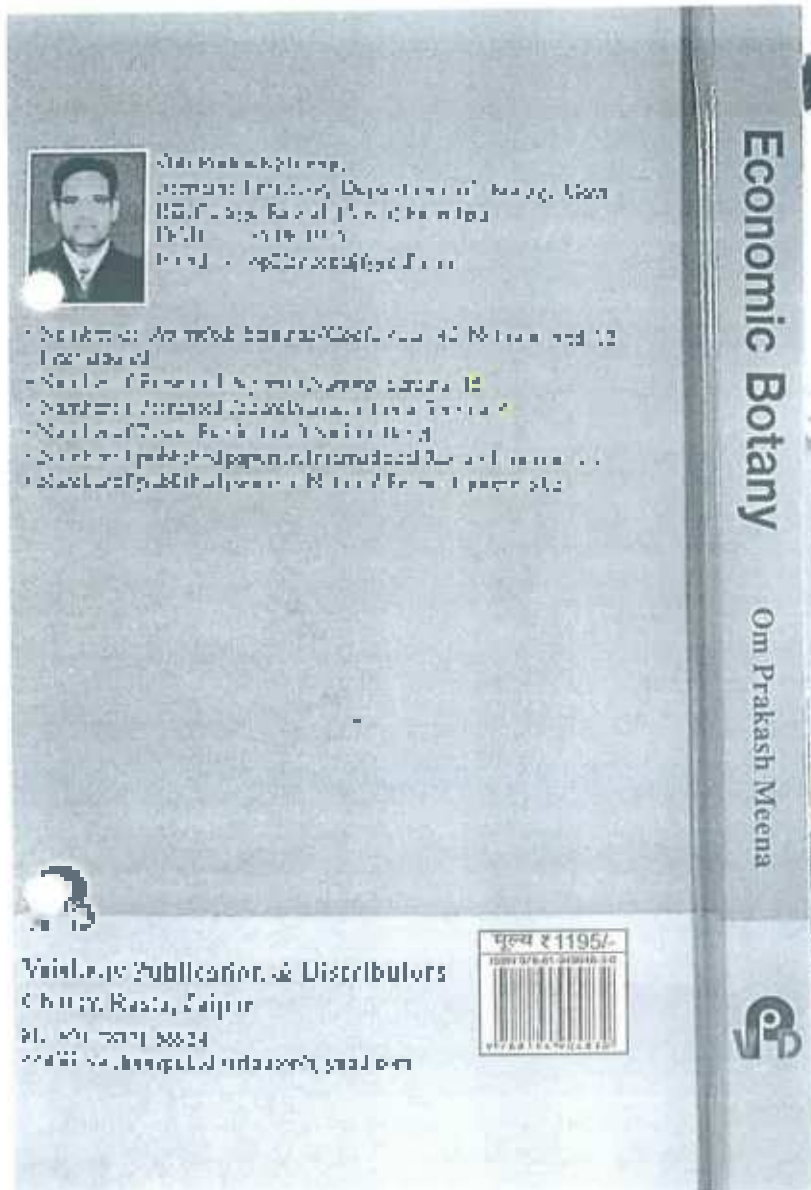
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पुस्तक प्रकाशन में पूर्ण सावधानी बरती गई है फिर भी किसी त्रुटि, कमी अथवा लोप का रह जना सम्भव है। यदि किसी भी त्रुटि, कमी एवं लोप के कारण क्षति अथवा क्लेप के लिए लेखक, प्रकाशक, वितरक अथवा मुद्रक का कोई उत्तरदायित्व नहीं होगा।

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वैदेशिक संबंधों का अर्थ है दो देशों के बीच होने वाला संबंध। यह संबंधों के माध्यम से एक देश दूसरे देश के प्रति अपना रुझान व्यक्त करता है। भारत के गृह सुविधियों में एक प्रमुख पहलू है कि भारत ने वैदेशिक संबंधों को सुदृढ़ बनाने के लिए कई कदम उठाए हैं। भारत की संविधान में वैदेशिक संबंधों को सुदृढ़ बनाने के लिए कई प्रावधान हैं। भारत की संविधान में वैदेशिक संबंधों को सुदृढ़ बनाने के लिए कई प्रावधान हैं। भारत की संविधान में वैदेशिक संबंधों को सुदृढ़ बनाने के लिए कई प्रावधान हैं।

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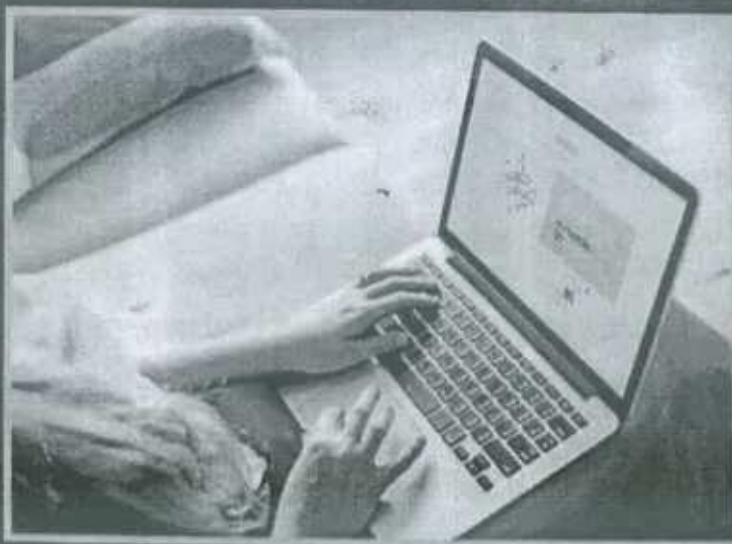
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बाल मजदूरी : भ्रष्टा, चुनौती एवं समाधान

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बालक राष्ट्र की अमूल्य सम्पत्ति होते हैं क्योंकि भविष्य में यही बालक अनुशासित, चरित्रवान, कर्तव्यनिष्ठ व जागरूक नागरिक बनकर राष्ट्र के नव निर्माण व विकास में अपनी महत्ती भूमिका निभाते हैं। बच्चे एक पौधे के समान होते हैं, जिस प्रकार एक पौधे को उचित पोषण, संरक्षण व अनुकूल वातावरण प्रदान किये जाने के पश्चात एक फलदार वृक्ष के रूप में बदल जाता है। बाल मजदूरी की समस्या भारत अथवा अन्य विकासशील देशों में व्यापक रूप से देखी जा सकती है लेकिन संयुक्त राज्य अमेरिका, ब्रिटेन, फ्रांस, जर्मनी जैसे विकसित देश भी इस संवेदनशील समस्या से ग्रसित हैं। बाल मजदूरी के कारण देश का भविष्य बदहाल जीवन जीने को मजबूर है। इनमें से अधिकांश बच्चों ने या तो विद्यालय देखा ही नहीं या फिर बीच में ही अध्ययन छोड़ दिया है। जबकि यहाँ बालक राष्ट्र के भाग बनकर अर्थ उन्नति भविष्य जोते हैं। यूनेस्को की रिपोर्ट में बच्चों के महत्वपूर्ण सराहना के बाद संवेदनशील किया गया है। मानव संसाधनों के विकास का मानव संसाधन विकास की प्रत्येक दीर्घकालीन योजना बच्चों से प्रारम्भ होनी चाहिए। बाल मजदूरी सभ्य समाज के अन्तर्गत एक अभिशाप से कम नहीं है जो देश के विकास व वृद्धि में बाधक के रूप में बड़ा मुद्दा है। बाल्य अवस्था जीवन का सबसे महत्वपूर्ण क्षण होता है। जिसे प्रत्येक बालक को जन्म से जीने का अधिकार होता है। बालको को बचपन जीने का पूरा अधिकार है लेकिन मर्यादित। ८ घण्टे एक बालक कार्य करते हैं उनकी बाल मजदूरी के कारण इन बालको को अच्छे की तरह जीवन जीने पर मजबूर होना पड़ता है। जीवन की पहली आवश्यकताओं की पूर्ति के लिये उनके माता बचपन खाना पकड़ते हैं। अधिकांशक बाल मजदूरी को निवारण के प्रति बचपन से ही विशेष ध्यान देना चाहिए। सही रूप में प्रत्येक अभिभावक को यह समझना चाहिए कि बाल मजदूरी का निवारण करना राष्ट्र के विकास में भारीदार माना जा सकता है।

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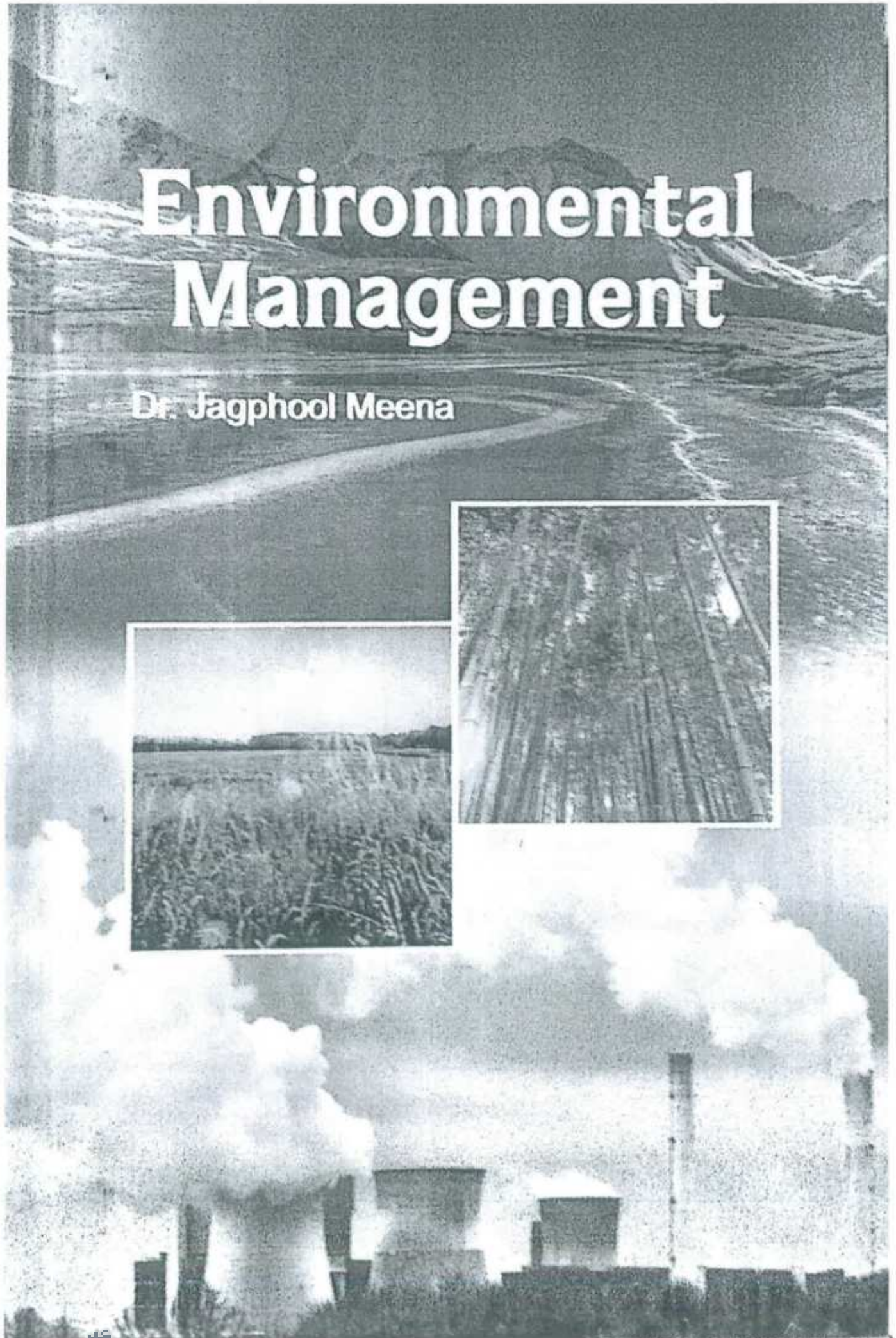
सभी चुनौतियाँ ही उनसे विन्न-विन्न लिंगों के वास्तविक सामान माना जाए और उनकी आकांक्षाओं के अनुसार अपने जीवन में लिंगभेद लेने और विकल्प चुनने की अनुमति दी जाए, इसे ही लैंगिक समानता कहा जा सकता है।

मनुष्य एक सामाजिक प्राणी है अतः उसको सामाजिकता अंगेक्षित है। समाज का मान: यानि स्त्री-पुरुष दोनों से मिलकर बना गया है अतः इस मान-मान की रक्षा के लिए दोनों का ही सामान महत्त्व है, क्योंकि ईश्वर स्वयं हमें एक समान ही पृथ्वी पर अवतरित करता है, लेकिन जब हम इन आदर्शों से बाहर निकलकर भ्रष्टाचार करते हैं तो समाज की कसौटी राखी है जो हमारा सामना होता है। नानपक्षी सम्यक् होने हुए भी सदियों की चुकी है, लेकिन आज भी आधी-आधी अपने अस्तित्व के लिए संवर्षित है। वर्तमान से इतिहास की ओर दृष्टि करने तो सा उस युग में भी पहुँच जाएँ, जहाँ मनुष्य अन्य भी नहीं हुआ था, तो ही हम पायेंगे कि समाज में स्त्रियों को हमेशा से दोषन पड़ने का नागरिक समझा जाता रहा है। उनकी अंगेक्षित एवं गुलागी जैसा जीवन जीने के लिए मजबूर किया जाता है।

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Environmental Management

Dr. Jagphool Meena



Preface

Environmental Management offers research and opinions on use and conservation of natural resources, protection of habitats and control of hazards, spanning the field of environmental management without regard to traditional disciplinary boundaries. The book aims to improve communication, making ideas and results from any field available to practitioners from other backgrounds. Contributions are drawn from biology, botany, chemistry, climatology, ecology, ecological economics, environmental engineering, fisheries, environmental law, forest sciences, geosciences, information science, public affairs, public health, toxicology, zoology and more.

As the principal user of nature, humanity is responsible for ensuring that its environmental impacts are benign rather than catastrophic. Environmental Management presents the work of academic researchers and professionals outside universities, including those in business, government, research establishments, and public interest groups, presenting a wide spectrum of viewpoints and approaches.

Date: 22 January, 2020

- Dr. Jagdish Meena

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About the Book

This volume of *Management: ethics, research and opinions on fish and water-related natural resources* presents a collection of techniques and methods that have been used in the field of environmental management without regard for a formal classification scheme. The book aims to improve environmental study, promote ideas and widen access to any field available to practitioners from other backgrounds. Contributions are drawn from biology, botany, chemistry, climatology, ecology, economics, geomatics, environmental engineering, fisheries, environmental law, forest sciences, geosciences, information science, public affairs, public health, sociology, zoology and others.

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Scientific World Around You and in Cosmos

Editors :

Ashok K. Kakodia

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Photocatalytic Reactions of Cobalt(III) Complexes : A Comparative Study

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Abstract: Photocatalytic reactions are very common now a day. Photocatalytic reactions (photocatalyst used zinc oxide) reported separately in many metal complexes but here the comparative study of different complexes of Cobalt(III) studied. A comparative study of Co(III) complexes having different number of NH₃ ligands in its coordination sphere particular descending behavior reported. A tentative mechanism for the photodecomposition reactions of hexa cobalt(III) complexes has been proposed.

Keywords: photocatalytic reaction, semiconductor oxides, photodecomposition

Introduction

The photocatalytic reactions of Co(III) ammine complexes has been extensively studied and it was observed that the involvement of surface bonded intermediate in the decomposition of hydrogen peroxide and hydroxy ions as a photocatalyst. A photocatalytic reaction of metal (Co) and the use of their Co(III) particles in the reduction of organic redox species have also been investigated by Ullman and co-workers and reported that it has been observed that Co(III) ions hydrogen can be produced by the simultaneous photochemical reduction of H₂O₂ and H₂O when solution containing [Co(NH₃)₆]³⁺ different Co(III) species in the hexammine complex were irradiated with visible light. The photochemical reaction in the presence of ZnO semiconductor has been studied by Mendicino and Brown¹ whereas Miska² however the photo effect is ZnO photocatalytic photochemical redox reaction of the ZnO water to produce hydroxyl radicals has been investigated by Biswas and Ghosh³ and the photochemical reaction of the ZnO surface has been reported as an efficient photocatalyst by Jang⁴ for the photocatalytic function and the deposition of photo catalytic material from the cobalt complex was found to be responsible for the formation of ZnO photocatalytic complex. The photocatalytic reactions for photochemical redox reaction of the ZnO photocatalytic reaction mechanism which uses visible light driven oxidation were synthesized by covalent integration of a light harvesting complex [Ru (bpy)₃]²⁺ and Co₂O₃ cubane water oxidation catalyst studied by Zhou *et al.*⁵ In this work they studied the Ru-Co molecule is highly active photocatalyst through molecular design. Some cobalt doped BiVO₄ (Co-BiVO₄) photocatalytic composites for the degradation of Methylene blue dye in dilute aqueous solution was extensively studied by Zhao *et al.*⁶ They found that Co-BiVO₄ was stable and resistant to photo corrosion during the photocatalytic oxidation of organic compounds such as Methylene blue. So we can say that photocatalytic reactions of Co(II) and Co(III) were extensively studied. Now the role of

chloride ion in the coordination sphere of hexa (octahedral) Co(III) complexes of series [Co(NH₃)₆Cl]³⁺ were studied and proposed.

Experimental Methods and Observations

1. Hexamminecobalt(III) chloride

The photocatalytic reaction of [Co(NH₃)₆]³⁺ in the presence of ZnO was carried out. The progress of the reaction was monitored at wavelength of absorption $\lambda_{max} = 440$ nm. 0.0198 g of the complex dissolved in 50 ml of doubly distilled water and ZnO was added to the solution was exposed to sunlight. It was found that the intensity of light falling on the surface of the reaction mixture was 26.0 mW/cm². A 10 x 10 cm glass reaction cell containing 100 ml of the reaction mixture was used. The optical density was measured at 440 nm. The photochemical reaction was studied at different times from 5 to 150 minutes. The expected results are given in Table 1 and graphically represented in Figure 1.

Table 1: Variation in optical density with time for [Co(NH₃)₆]³⁺

Time (min.)	Optical Density	1 - log
5	0.125	0.096
10	0.146	0.164
15	0.153	0.184
20	0.131	0.117
30	0.140	0.140
45	0.158	0.145
60	0.139	0.200
75	0.141	0.200
90	0.155	0.164
105	0.163	0.200
120	0.150	0.200

Role of Persulfate in Wastewater Treatment in Presence of Light Review

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Abstract: Persulfate (PS) has attracted great attention as an alternative to H_2O_2 for advanced oxidation processes. Sulfate free radicals can be generated from persulfate and peroxymonosulfate (PMS) using various activation methods. Current studies cover a long list of organic compounds including pharmaceuticals, pesticides, halogenated compounds. An extensive review of recently published experimental parameters and results for the destruction of organic compounds by persulfate is presented. This review can provide an overview for the systematic understanding of the mechanism and effects of persulfate combinations.

Keywords: Oxidation of organic pollutants, persulfate and peroxymonosulfate (PMS).

Introduction

Dyes are widely used in industries such as textiles, rubber, paper, cosmetics, foods, etc to color their products. The dyes are invariably left as the measure waste in these industries, in textile industries the process of dyeing results in the production of large amount of waste water. Waste water from textile industries contain different types of synthetic dyes, which are mostly toxic, mutagenic and carcinogenic, more over they are very stable to light, temperature and microbial attack. Dyes in wastewater cause aesthetic problems, absorb and scatter sunlight and thus effect the aquatic ecosystem.

Advanced chemical oxidation is a treatment technology that has the potential to completely destroy harmful organic contaminants in water. It is also known as Advanced Oxidation Process (AOP) and has played a crucial and important role in water and wastewater treatment, and remediation of contaminated sites. In AOPs, the reactions follow a specific oxidation pathway, which includes the formation of free radicals. In this study, sulfate free radicals ($SO_4^{\cdot-}$) generated from persulfate ($S_2O_8^{2-}$) and peroxymonosulfate will be investigated. Persulfate has recently been studied as an oxidant alternative for treating organic contaminants in aqueous system due to its high aqueous solubility and stability, relatively low cost and benign end products. Compared to hydroxyl radicals, sulfate radicals have a longer half-life. Compared to hydroxyl radicals, sulfate radicals have a longer half-life.¹

Among the advanced oxidation processes the homogeneous AOPs employing peroxydisulfate and UV peroxydisulfate have been found to be very effective in degrading dyes and pollutants.^{2,3} As a source of sulfate radicals, peroxydisulfate ($S_2O_8^{2-}$) has the advantages of high aqueous solubility and

high stability at room temperature. In the oxidation of persulfate ions will be produced as the end-product, which leads to a decrease in pH and an increase in sulfate concentration in effluent.⁴ The $SO_4^{\cdot-}$ is practically inert and is not considered to be a pollutant; the United States Environmental Protection Agency (USEPA) has listed it under the secondary water standards with a maximum concentration of 1.43 mM, based on esthetic reasons such as taste and odor.

ISCO was established in the 1990s, as a process where oxidants are introduced into the subsurface to treat a contaminant of concern and transform ground-water contaminants into less harmful chemical species. ISCO represents a series of chemical oxidation technologies, which includes oxidants species such as ozone (O_3), permanganate (MnO_4^-) and catalyzed hydrogen peroxide (H_2O_2) (CHP).

CHP is the most often used ISCO process. It is injected into wells, where it reacts directly with organic contaminants or decomposes into hydroxyl radicals. Permanganate is primarily by direct contaminant oxidation. It is a non-selective oxidant, being most reactive with alkenes. It has been used primarily for aquifers contaminated with trichloroethene (TCE), perchloroethene (PCE) and trichloroethane.

The newest ISCO agent was persulfate ($S_2O_8^{2-}$) which has become an increasingly popular oxidant that can be used in the subsurface as compared to H_2O_2 and O_3 , and can persist in the subsurface for weeks.^{5,6,7}

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Cadmium Sulphide as Photocatalyst: A Review

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Abstract: Recently, photocatalysis of various synthetic dyes has been studied in terms of their absorbance and the photocatalytic activity. Several photocatalysts such as copper(II) sulphate, cadmium sulphide, zinc sulphide, titanium dioxide, iron(III) hydroxide, zinc oxide, ZnO, SnO, NiO, Cu₂O, Fe₂O₃, and also CdS have been studied as photocatalysts. CdS photocatalyst is characterized by its wide band gap and high stability. Various process parameters like photocatalytic dose, dye concentration, dye concentration, etc. have been varied and highlighted. This paper reviews recent advances in photocatalytic degradation of various synthetic dyes from water and wastewater using CdS as photocatalyst.

Keywords: Photocatalysis, Dye, Photodegradation

Introduction

Energy and environmental issues are the major challenges of 21st century at a global level. Among the various ways have been reported for hydrogen production is a clean energy source and for the degradation of organic pollutants.^{1,2}

According to the IUPAC, photocatalysis is defined as a reaction which essentially involves a step in which a substrate in the presence of light.³ Photo catalysis may also be described as a process in which the electron-hole pairs generated by a photocatalyst in semiconductor materials under catalytic action that decompose organic chemicals.

Photo-catalytic process gets a significant boost if a suitable photocatalyst material is selected, which is able to absorb light as well as to form the electron-hole pairs. Photocatalytic reaction can utilize the electron-hole pairs to oxidize or reduce any substrate whose redox potential is higher than the valence band or lower than the conduction band. CdS, ZnS, CuS, SnS, and SnO₂ are the commonly used photocatalysts. Various properties of CdS are summarized in table 1 and potential band diagram in table 2.

Table 1. Some Semiconductors and their band gaps

S. No.	Semiconductor	Band Gap(eV)
1.	CdS	2.1
2.	ZnS	2.5
3.	FeO	3.2
4.	SnO ₂	3.4
5.	ZnO	3.2
6.	Fe ₂ O ₃	2.2
7.	SnO	2.5

The photocatalytic process of CdS semiconductor as a catalyst in a photocatalytic process is illustrated in fig. 1.

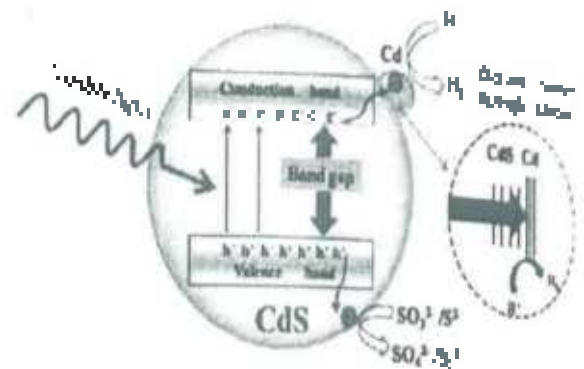
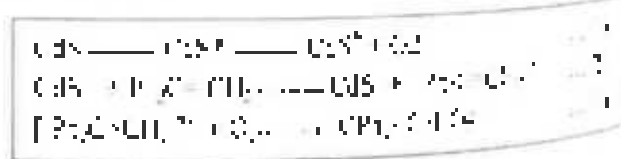


Figure 1. Schematic diagram of CdS photocatalytic process

CdS is the most extensively used photocatalyst due to its activity under visible light. It has high photocatalytic activity (CdS) as compared to the titanium dioxide photocatalyst.^{4,5}

Cadmium sulphide is an n-type semiconductor having a wide band gap (2.1 eV), compared to the band gap of ZnO (3.2 eV) and other band gap of CdS (2.1 eV).^{6,7} Harbour and Hair¹³ investigated photoinduced electron transfer reactions of aqueous cadmium sulphide dispersion in the presence of electron acceptors. Kano *et al.*¹⁴ reported that epoxides and benzophenone are formed on irradiating CdS in organic solvents containing 1,1-diphenylene and its derivatives in oxygen.



Application in Dye Degradation

Yin *et al.*¹⁵ reported photoreductive dehalogenation of halogenated benzene derivative using ZnS and CdS nanocrystallites as photocatalyst. Light induced catalytic oxidation of benzhydrol by CdS and its effect on secondary

Integrated Farming System for Sustainable Agriculture

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Integrated farming is a dynamic approach which can be applied to any farming system around the world. Developing countries around the world are promoting sustainable development through sustainable agricultural practices which will help them overcome socio-economic as well as environmental issues. The Integrated farming system recycles all wastes so that little is lost. In integrated crop livestock farming system, crop residues can be used for animal feed, while manure from livestock is used as a fertilizer. Integrated Farming System also play an important role in improving the soil health by increasing the nitrogen, phosphorous, organic carbon and microbial count of soil and thus, reduces the use of chemical fertilizers.

Introduction
 Integrated farming system is the system invariably having integration of crop and animal components. Where, the waste and byproduct of one component can be used for other component. Developing an integrated farming system needs an appropriate technology, because such technology is partly absent in sustainable farming and food security. Integrated farming benefits more in terms of economic returns than the monocrop. The demand for food is increasing day by day and the area of agricultural lands is decreasing. There is continuous conversion of agricultural lands to residential lands and also the number of farmers working in the field is drastically decreasing.

The primary objective of the IFS is to maintain production of food and other goods and services that contribute to food security and income generation to the rural poor. Other objectives that are just as important are achieving environmental sustainability and contributing to agriculture ecosystem services. Some countries with abundant land are still able to overcome their food problem through the use of technology. Crop production can increase if irrigated areas are expanded or irrigation is intensified, but this may increase the rate of environmental degradation.

Integrated Farming System is very effective in solving the problems of small and marginal farmers. The Integrated Farming system includes high quality organic food, fiber and renewable energy which are produced by using air, water and soil. The major components of integrated farming are crops, livestock, birds and trees. Livestock components may be cow, goat, sheep etc.

The components in the integrated farming system are interlinked and a decision on one affects the other. The success of an integrated farming system will depend on the use of renewable farm resources.² Many factors affect the integrated farming such as: soil and climate, resource availability, labor, resources and land, management skills etc.

Best management practices, sustainable agriculture and conservation agriculture are practices that intend to minimize the adverse environmental impacts of farming.

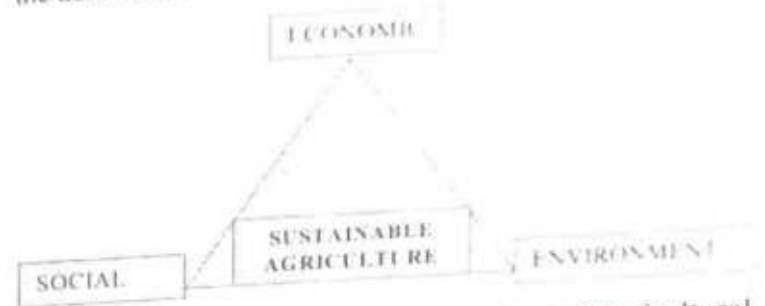


Fig. 1: The Three Interlinked Dimensions of Agricultural Sustainability⁴

The major attributes of sustainable agriculture as put forward by the Food and Agriculture Organization (FAO) are⁵: it is resource conserving, environment friendly, technically appropriate, economically acceptable, and socially justifiable.

Sustainable agriculture⁶ is defined as "an agricultural system combining sustainable agricultural practices while simultaneously discontinuing or reducing the use of agricultural practices harmful to the environment". The agricultural sector has to deal with major issues within economic, social and environmental dimensions (Fig. 1) which are given equal importance by the concept of sustainable agriculture.⁷ The most of the societal issues are nowadays closely linked, global, and develop rapidly, sustainable agriculture promises effective solutions to establish and strengthen a secure agriculture, food system and safe energy for a healthy and sustainable future.⁸

Objectives of IFS

Integrating system with primary, inter-related nature of crops, plants, animals, implements, labor and water, etc. for improved farm productivity.

Studies on Drinking Water Quality Parameters of Some Villages of Masooda Block of Ajmer District: A Mathematical Approach

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Ajmer district is an oasis wrapped in the green hills. Today, this district is a popular pilgrimage center for the Hindus as well as Muslims. Masooda is the south east tehsil of Ajmer district. Masooda block has limited pool of surface water. The annual rainfall averaging fifty cm. per annum. It is fluorosis affected Tehsil of Ajmer district in the state of Rajasthan. A ground strip in the base of Aravallis Mountain series which is expanded from Panch Mahal of Gujrat to Gurgaon in the south through south east of Rajasthan. This area contains many minerals viz. CaF_2 (Fluorite), $Ca_3(PO_4)_2$ (Apatite), $KAlSi_3O_8 \cdot (OH)_2$ (Biotite), $KAl_2(Si_2O_7)(OH)_2$ (Muscovite), $K(LiAl)_3(SiAl)_4O_{26} \cdot (OH)_2$ (Cristobalite), $(MgFe)_2(Si_2O_7)(OH)_2$ (Rock Phosphate), $Al_2SiO_5 \cdot (OH)_2$ (Topaz). So this area is in high concentration of Total dissolve solids, Fluoride, Chloride, Alkalinity and Nitrate due to this ground strip of Aravalli Mountains. A systematic study has been carried out to explore the water quality index of ground water of various sources of Ajmer district. Water samples from tube wells, open wells and step wells were collected and analyzed for pH, Chloride, Nitrate, Total Dissolve Solids and Fluoride. From the study it is clear that the quality of the ground water in the district is deteriorating due to agricultural chemical fertilizers. Aravalli regions and water table depletion. The water quality index (WQI) revealed that the water quality of these villages is very poor and unsuitable for drinking purpose. The findings of this study along with remedial measures will be able to aware people against this problem. Present study recommends that private should be given priority monitoring and indigenous technologies should be adopted to reduce fluoride in drinking water.

Keywords: Drinking water quality, Fluoride, Chloride, Alkalinity, Nitrate, Aravalli

Introduction
 Water is a natural resource that is essential for the survival of all living organisms. It is a vital component of the human body and is necessary for the maintenance of life. Water is also a key factor in the development of the environment and the economy. The quality of water is a major concern for public health and the environment. The World Health Organization (WHO) has defined water quality as the degree to which water is fit for its intended use. The quality of water is determined by a number of factors, including the presence of harmful substances, the amount of dissolved solids, and the pH of the water. The quality of water is also affected by human activities, such as the use of fertilizers and pesticides in agriculture, and the discharge of industrial effluents into water bodies. The quality of water is a complex issue that requires a multidisciplinary approach to address. This study aims to investigate the water quality parameters of some villages in the Masooda block of Ajmer district, Rajasthan, India. The study will focus on the measurement of pH, Chloride, Nitrate, Total Dissolve Solids (TDS), and Fluoride. The results of the study will be used to assess the water quality index (WQI) and to identify the sources of water pollution. The study will also provide recommendations for the improvement of water quality in the study area.

1.1 Health problems in India, Fluoride pollution of water is a serious cause of diseases. Drinking more excessive fluoride intake can cause different types of Fluorosis.

Skeletal Fluorosis

Skeletal Fluorosis is a bone disease. Skeletal fluorosis is a chronic disease that develops over a long period of time. Maximum ill effects of fluoride are observed in the spine, knee, ankle and shoulder joints. Fluorosis also affects the central points of the body and feet. In a disease that develops by excess fluoride causing chronic effects.

Dental Fluorosis - Dental fluorosis is an irreversible condition caused by excessive ingestion of fluoride during tooth formation. Common signs of disease are:

- (i) Dental caries (tooth decay)
- (ii) Hypoplasia
- (iii) Enamel fluorosis

Non-Skeletal Fluorosis

The concentration of fluoride affects all parts of the body. It has been suggested in case of chronic fluoride poisoning the involvement of fluoride in the organs of the body are as follows:

- (i) Endocrine
- (ii) Cardiovascular muscles
- (iii) Immunity

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