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## **Influence of Superficial Upflow Air Velocity on Aerobic Granulation in Sequencing Batch Reactors**

B. K. BINDHU<sup>1+</sup> AND G. MADHU<sup>2</sup>

The effect of shear force on aerobic granulation in sequencing batch reactor (SBR) was studied in three trials – 1, 2 and 3 with superficial upflow velocities of 2, 3 and 4 cm/s respectively. Denser and more compact granules could be developed in trial 2 and 3, while the granules formed in trial 1 were loose structured. The settling ability of the sludge developed in all the cases were explained in terms of sludge volume index and settling velocity. The biomass development in the SBR was found increased with the shear force. The chemical oxygen demand removal efficiency achieved at steady state (93.8%, 97.9% and 97.1% for trial 1, 2 and 3 respectively) showed that an optimum aeration has to be selected for the best performance of the reactor. This study provides a sound understanding of the crucial role of shear force in aerobic granulation, sludge settleability and pollutant removal.

**Key words :** *Superficial upflow air velocity, aerobic granulation, sequencing batch reactor, shear force, sludge volume index, settling velocity*

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## Cobalt Ferrite Nanoparticles for Zn (II) Removal

K.R. ASWIN SIDHAARTH<sup>1+</sup> AND J. JEYANTHI<sup>2</sup>

The present study involves the applicability of cobalt ferrite nanoparticle as an adsorbent for the removal of zinc from the synthetic solution. The cobalt ferrite nanoparticle was synthesized by co-precipitation method by incorporating chlorides of respective metal ions with sodium hydroxide as pH stabilizer. The synthesized nanoparticle was characterized using X-Ray diffraction, scanning electron microscope and transmission electron microscope analysis. The zero point of charge of the nanoparticle was determined by solid addition method. TEM and XRD analysis revealed that size of nanoparticle was in the range of 16-49nm. From the scanning electron microscope studies, the structure of the nanoparticle was agglomerated. Batch experiments were carried out to optimize the influencing parameters such as contact time, dosage, pH, initial metal ion concentration, and agitation speed. To test the ground efficacy the results were subjected to modeling of two domains, isotherm (Langmuir, Freundlich, Temkin) modeling and kinetic (Intraparticle Diffusion) modeling. The column studies have been carried out to optimize the bed depth and the column models were developed.

**Key words :** *Cobalt ferrite nanoparticle, particle size, XRD, TEM, SEM, adsorption, zinc removal, column*

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## **Assessment of Pollution Status of Vattakkayal, a Part of Ashtamudi Lake - Ramsar Site in Kerala (India) Using Multivariate Statistical Analysis**

S. SEETHAL LAL<sup>1+</sup>, D. S. JAYA<sup>1</sup> AND E. SHERLY WILLIAMS<sup>2</sup>

The study presents a comprehensive evaluation of the water quality of Vattakkayal, a part of Ashtamudi lake-Ramsar site in Kerala, India. Water samples from 5 sampling sites in the Lake were analysed for various water quality parameters. The measured water quality parameters were compared with the guidelines proposed by the WHO for drinking water and natural background levels. The results show that the values of major water quality parameters were higher than the maximum permissible limit of natural background concentrations and recommended values by WHO. Multivariate statistical techniques like ANOVA and factor analysis were conducted on the water quality parameters to establish the relationship between the parameters and their possible sources. The major water pollution threats in the lake were identified as urban and agricultural land uses. This technique is believed to assist decision makers in identifying priorities to improve water quality that has deteriorated due to various land uses.

**Key words :** *Factor analysis, human activities, pollution, Vattakkayal, water quality*

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## **Decadal Variation of Water Quality in Vellayani Lake, A Tropical Freshwater Lake in South West India**

A. KRISHNAKUMAR<sup>+</sup>, VINDUJA. V AND REVATHYDAS

Lakes are important feature of the Earth's landscape. They provide a multitude of uses and are prime regions for human settlement. Uncontrolled anthropogenic interventions along with climate change phenomenon are largely contributing in declining the water quality of fresh water lakes. The present study attempts to analyze the water quality of Vellayani lake, Thiruvananthapuram district, Kerala and to assess the extent of variation happened over a decade by comparing the previous data of 1998. The study revealed that the water quality parameters like Turbidity, Total dissolved solids, Calcium, Magnesium, Chloride, Potassium, Sodium and Iron were increased over the last fourteen year period indicating deteriorating water quality. The climatic changes along with urbanization effects have brought this change in quality of the water and throws light into urgent care and attention needed to protect the lake from further degradation for the sustainable use of the pristine lacustrine system.

**Key words :** *Vellayani lake, water quality, decadal variation, drinking water standard*

## **Study on Effectiveness of Various Soil Amendments on Soil Properties, Growth Pattern of *Cajanus cajan* L. in Mine Degraded Soils**

SHRABANI SEN<sup>1</sup> AND VIPIN KUMAR<sup>2\*</sup>

Surface mining has caused critical damages to the environment with respect to soil degradation. The present study was undertaken to examine the influence of the application of various soil amendments on soil properties and the growth and yield for *Cajanus cajan* L. cultivation in mine degraded soils. An experiment was conducted on *C. cajan* L., a widely cultivating legume in India for its highly nutritious seeds. Plant growth in terms of different parameters (% seed germination, shoot length, root length, total dry weight, number of leaves and number of root nodules) was measured. The experimental results indicated that all the combinations significantly increased plant growth and soil fertility. Mine spoil analysis at harvest revealed that all the physical and chemical properties were improved significantly ( $p \leq 0.05$ ) in all the combinations after plantation over the untreated control. The percentage increase in crop growth, grain yield as well as soil nutrients over control was also observed.

**Key words :** *Mine degraded soil, soil amendments, bio-efficacy, re-vegetation, Cajanus cajan*

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## **Status of Human Health in Industrial Neighbourhood A Study of Golden Corridor, Vadodara, Gujarat**

ROLEE KANCHAN<sup>1\*</sup> AND CHANDAM CHANDABADANI DEVI<sup>2</sup>

The process of industrialization is considered as one of the principal process responsible for regional and economic development of a region. This economic and associated social phenomenon of industrial growth is accompanied by environmental problems which would have adverse affects on human health. Globally, the dumping of industrial bi-products and its affect on human health is a growing concern. The present study had been carried out to assess the disease pattern of the residents in the vicinity of the Chemical and Petrochemical Industrial Area, Vadodara Taluka, Vadodara, Gujarat. The industries of area produced a variety of compounds and petroleum base products. The study was based on 7.64% households of eight different sites which adjoin the industrial estate. High prevalence of diseases was observed in the study area and it was more conspicuous in dental, general (skeletal and dullness/dizziness) and hair problems. Moreover, the rate was higher in females and also in elderly.

**Key words :** *Industrialisation, human health, disease pattern, prevalence rate, water contamination*

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## **Adverse Raw Water Quality Effects on Operating Conditions of Water Treatment Plants: Analysing Conditions**

DINESH K. PERIWAL\*<sup>+</sup> AND A.N. MODI\*\*

The increase in water consumption during recent years has emphasized the necessity for water utility personnel and engineers to produce water economically and in sufficient quantities. This is particularly true during peak demand periods, which may often coincide with unfavorable operating conditions caused by adverse quality. The treatment methods used to cope with these conditions are not normally successful and inevitably result in short filter runs. The short filter run is important primarily because it results in loss of revenue to the water utility. Short filter runs create expensive problems. Loss in plant capacity and excessive wash water usage are attributable directly to this problem. In addition, poor raw water quality, which, in turn, usually requires higher chemical doses, generally occurs during period of short filter runs. If such periods are prolonged, the water treatment plant so afflicted is faced with a sizable financial loss, possible costly expansion and of more importance a reduction in service adequacy. Water suppliers use a variety of treatment processes to remove contaminants from raw water. The most commonly used processes include filtration, flocculation, sedimentation and disinfection for surface water. Water utilities select a combination of treatment processes that is the most appropriate to treat the contaminants found in the raw water. The appropriate technical skills, if applied, may impart great benefits, both spatially and temporarily, to augment the existing water treatment facilities. The raw water quality associated problems with reference to WTP's at Jodhpur city have been documented in this paper.

**Keywords :** *Water treatment plant, operating condition, raw water quality*

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## Kinetic Studies on Removal of Phenolic Compounds from Wastewater Using Agricultural Waste: A Review

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The release of phenol from wastewater by various industries like petroleum, petrochemical, pulp and paper causes harmful effects on the environment. Adsorption using activated carbon from agricultural waste precursor material has proven to be effective for the removal of phenolic compounds from wastewater. Therefore, it is important to understand the sorption kinetic mechanism in wastewater treatment, since it brings down the problem of large sludge-handling processes. The kinetic analysis also helps in designing large scale treatment plants which have high efficiency and results in high quality treatment of the effluent. In addition, it also assists in proposing the mathematical models, reaction pathways that describe the characteristics of an actual treatment plant. Various theoretical kinetic models are available for determining the mechanism of the adsorption process. In this review, mainly six kinetic models were investigated to study the adsorbate-adsorbent interactions and to find the rate limiting step. From the recent literature, higher correlation coefficient values were obtained for the pseudo-second-order kinetic model showing that it is the most appropriate one for most of the systems. The pseudo-second order kinetic equation shows that the chemisorption was found to be rate determining step in most of the adsorption process.

**Key words :** *Wastewater, phenol, adsorption, activated carbon, kinetic models*

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## A Review on Removing Natural Organic Matter for Reducing Disinfection By-products

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Disinfection is inevitable in water treatment plants (WTPs) for killing pathogenic microorganisms. Surface waters sourcing most of the WTPs contain natural organic matter (NOM). Disinfectants react with NOM and form disinfection by-products (DBPs) in water. The adverse health effects of DBPs are increasingly recognized. They pose serious threat to human health as many of them are carcinogenic while some others affect internal organs of our body. DBPs enter our body not just through ingestion, but even by inhalation, dermal adsorption etc. Hence World Health Organization and several countries have set limits on the concentration of DBPs in the water supplied. However, India is yet to adopt such regulations. Eliminating NOM, the precursors to DBPs, is the most effective way to reduce DBPs. Several methods like enhanced coagulation, granular activated carbon (GAC) filtration, pre-oxidation, microfiltration, nanofiltration etc., reduce the concentration of DBPs by removing NOM. Enhanced coagulation is effective and could be used at all WTPs already using coagulation without incurring additional capital cost. Though costly, filtration techniques are effective. But fouling of filters is a main hindrance. This review looks into the factors affecting formation of DBPs, characterization of NOM, effectiveness of enhanced coagulation with emphasis on its chemistry, filtration using GAC and pre-oxidation with potassium permanganate for removing NOM.

**Key words :** *Disinfection, NOM, DBPs, enhanced coagulation, GAC filtration, pre-oxidation*

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## **Treatment of Municipal Solid Waste Leachate: A Review**

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In India, Municipal Solid Waste (MSW) is generally dumped in open dumps. The heavily toxic leachates from these sites present significant variations in both volumetric flow and chemical composition. This paper reviews MSW leachate scenario in India and treatment options that can be applied. The impact of MSW leachate on ground water of the area nearby dump site is also discussed. Advantages and disadvantages of the various treatments are discussed in this paper. Year after year, the recognition of landfill leachate impact on environment has forced authorities to fix more and more stringent regulations for pollution control. In India open dump sites are used to dispose MSW and no treatment system is available for MSW leachate.

**Key words :** *Municipal solid waste, leachate, ground water, dump site, India*

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