

Physio-chemical characterization of sewage sludge generated from sewage treatment plant at Varanasi, in relation to nutrients and heavy metals for agriculture use

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ABSTRACT

Large amount of sewage sludge is generated during waste water treatment at sewage treatment plant (STP), as a result of the sedimentation and suspension of particles. The safe disposal and management of this concentrated sewage sludge poses a major challenge for town and city municipal corporations. However, this could also be used in agriculture as an input to partially replace recommended doses of fertiliser. Thus, the current study was conducted to investigate the physio-chemical and biological characteristics of sewage sludge (SS) and its potential application in agricultural fields as an organic manure. Sewage sludge samples were collected from sewage treatment plant (STP) at Bhagooagar, Varanasi, India and sieved in 2 mm mesh before being analysed for various physical and chemical characteristics. The processed sewage sludge possessed both major [total nitrogen (1.76 %), total phosphorous (1.29%), total potassium (1.15%)] and micro nutrients (Fe, Mn, Zn and Cu) and significant amount of organic carbon (8.67 %). However, this sewage sludge was also containing considerable amount of heavy metals like Cadmium (7.3 mg kg⁻¹), chromium (49.2 mg kg⁻¹), nickel (total 27.43 mg kg⁻¹), and lead (39.53 mg kg⁻¹), which were reported to be harmful to human beings, but these were lower than threshold limit recommended by Council of the European Communities, 1988 for agricultural use. Further, Bulk density and water holding capacity was 1.18 g cm⁻³ and 54.5 % respectively. With respect to microfauna, fungi were found more dominating than actinomycetes and bacteria in this sewage sludge. Therefore, considering use of this sewage sludge for agriculture may decrease the use of chemical fertilisers and make it more sustainable. However, in order to increase soil health without posing an environmental risk, sewage sludge must be carefully evaluated before being applied to soil especially for heavy metals and other hazardous pollutants.

Key words: Sewage sludge, Heavy metals, Cadmium, Chromium, Nickel and lead.

Introduction

Increase in population and urbanisation has led to excess production of sewage and whose manage-

ment and safe disposal is a contemporary challenge and needs more investigation. sewage waste water causes problems when it combines with water sources and posing negative impact on water qual-

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Monitoring of Water Quality F. Colin,Ph. Quevauviller,1998-07-21 Water can be considered as one of the basic elements supporting life and the natural environment a primary component for industry a consumer item for humans and animals and a vector for domestic and industrial pollution Various European Directives already provide a framework for the control of aquatic substances the quality of bathing surface and drinking water and effluent control Such regulatory measures are closely related to analytical measurements In order to comply with these regulations on a permanent basis treatment plants and distribution companies as well as water users and polluters need to implement automated measuring techniques such as sensors and other analytical tools in continuous or sequential mode to obtain suitable alarm systems and facilitate the management of water resources and decision making processes This approach is in continuous evolution within the European Union In view of the consequences of wrong measurements it is vital that reliable quality control systems be achieved and maintained At present only a small range of analytical parameters can be measured automatically it is therefore necessary to develop and validate new methods to extend the list of parameters The development of new methodologies requires that the most recent know how in fields such as optics electrochemistry biochemistry chemometrics and others be shared by experts In order to identify possible actions to be undertaken in the field of standards measurements and testing for monitoring water quality the Standards Measurements and Testing SMT Programme of the European Union organised a European workshop that was held in Nancy 29 31 May 1997 This workshop brought together researchers and industrial users with the aim to make an overview of the present state of the art to consider possible improvements in existing techniques and the need and possibilities of developing new advanced technologies **Methods for Wastewater Characterization in Activated Sludge Modelling** Henryk Melcer,2004-11-01 Mathematical modeling is a useful tool for the design analysis and control of wastewater treatment systems The activated sludge process is one of the most common processes used in wastewater treatment and therefore is a particularly important candidate for the application of mathematical models In the

1980s a task group organized by the International Association on Water Quality IAWQ developed a conceptual model of the activated sludge process which has become an industry wide standard for the development of computer based activated sludge models A recent version of the IAWQ model incorporates 19 components 17 processes and numerous rate and stoichiometric coefficients It is difficult and costly to quantify all of the necessary coefficients for any given application of the model consequently it is important to identify the most critical wastewater and biomass components and the relevant coefficients to be quantified for the most common uses of the model It is also important to provide guidance to potential model users on the use of default and or estimated values for the remaining parameters

Wastewater Sludge Nexus Ashootosh Mandpe, Maulin P. Shah, 2025-09-30 This book is a groundbreaking book that explores the critical issue of managing and handling industrial sludge in wastewater treatment facilities The proposed book addresses the urgent need for a comprehensive understanding of sludge management practices and introduces innovative solutions The proposed book highlights the significance of industrial sludge management in ensuring sustainable and environmentally friendly wastewater treatment processes It sheds light on the complex nexus between wastewater treatment plants industries and the resulting sludge generation Through meticulous research and expert insights this book explores various aspects of industrial sludge management including sludge characterization treatment technologies disposal methods resource recovery and environmental sustainability It presents a balanced approach focusing on practical applications while emphasizing the importance of scientific understanding and innovation By providing an in depth analysis of the challenges and opportunities in this area it becomes an indispensable resource for professionals researchers policymakers and students alike What sets this book apart is its unique content which covers a wide range of topics related to industrial sludge management It explores the latest advances in sludge treatment technologies emphasizing their efficiency cost effectiveness and environmental impact Additionally the book examines strategies for sludge minimization resource recovery and the utilization of sludge by products in various industrial applications The authors also discussed the regulatory frameworks and guidelines governing sludge management ensuring that readers have a comprehensive understanding of the legal aspects surrounding this critical issue Furthermore the book explores the potential risks associated with improper sludge management and offers practical solutions to mitigate them Overall the proposed book fills a significant gap in the literature by providing a holistic and up to date account of this crucial field It serves as a valuable guide inspiring sustainable practices promoting innovation and ultimately contributing to the advancement of sludge management in wastewater treatment processes

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Wastewater Sludge Dewatering Jens Aage Hansen, 1993

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Biology of Wastewater Treatment N. F. Gray, 1989 Aimed primarily at natural scientists this text provides a unified course in wastewater treatment It deals with the environmental and

biological aspects of wastewater treatment and disposal as well as the fundamental physical and chemical principles of treatment

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