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Treatment of organic and inorganic pollutants in wastewater by use of microorganism

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The term bioremediation has been introduced to describe the process of using biological agents to remove toxic waste from environment. Because of the adaptability of microbes and other biological systems, these can be used to degrade or remediate environmental hazards. Natural organisms, either indigenous or extraneous (introduced), are the prime agents used for bioremediation. The organisms that are utilized vary, depending on the chemical nature of the polluting agents, and are to be selected carefully as they only survive within a limited range of chemical contaminants. The first patent for a biological remediation agent was registered in 1974, being a strain of Pseudomonas putida that was able to degrade petroleum. Examples of aerobic bacteria recognized for their degradative abilities are Pseudomonas, Alcaligenes, Sphingomonas, Rhodococcus, and Mycobacterium. These microbes have often been reported to degrade pesticides and hydrocarbons, both alkanes and polyaromatic compounds. Many of these bacteria use the contaminant as the sole source of carbon and energy. Anaerobic bacteria are not as frequently used as aerobic bacteria. There is an increasing interest in anaerobic bacteria used for bioremediation of polychlorinated biphenyls (PCBs) in river sediments, dechlorination of the solvent trichloroethylene (TCE) and chloroform. Ligninolytic fungi such as the white rot fungus Phanaerochaete chrysosporium have the ability to degrade an extremely diverse range of persistent or toxic environmental pollutants. Methylotrophs, aerobic bacteria that grow utilizing methane for carbon and energy. The initial enzyme in the pathway for aerobic degradation, methane monooxygenase, has a broad substrate range and is active against a wide range of compounds, including the chlorinated aliphatic trichloroethylene and 1, 2dichloroethane.

Therefore, microorganisms represent a promising, largely untapped resource for new environmental biotechnologies. Research continues to verify the bioremediation potential of microorganisms. For instance, a recent addition to the growing list of bacteria that can reduce metals is Geobacter metallireducens, which removes uranium, a radioactive waste, from drainage waters in mining operations and from contaminated groundwater.

Biography

Abhinav K Srivastava is 26 year old Research Scholar from Amity Institute of Biotechnology, Amity University Uttar Pradesh. He has completed his M.Sc. Biotechnology from Amity University and has worked as an Environmentalist with a Canada based MNC for a year. After that he worked as Faculty of Biotechnology at an Institute situated in Noida. Presently he is doing his research in Environment Biotechnology and trying to find out a new micro-organism based technology for the efficient degradation of inorganic and organic waste.

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Developing a statistical model for fermentative hydrogen production

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The individual and interactive effects of significant process parameters were investigated for the optimization of biohydrogen production using glucose as a substrate. Response surface methodology was applied to optimize the process parameters for maximum hydrogen production using Enterobacter aerogenes. The important factors influencing hydrogen production such as glucose, initial pH, inoculum size, tryptone, yeast extract, and ferric chloride were screened using Plackett-Burman design. Based on the Plackett-Burman design, significantly influencing process variables identified were glucose, initial pH and ferric chloride. 3-dimensional (3-D) response surface and 2-dimensional (2-D) contour analysis were adopted to further investigate the mutual interaction between the parameters and to determine the optimal values for maximum hydrogen yield. The optimal values estimated using the statistical design to achieve maximum H_2 yield of 1.69mol H_2/mol glucose were glucose 16.56g/l, initial pH 6.15 and ferric chloride 213.13mg/l.

Keywords: Biohydrogen; Modified Gompertz model; Box-Behnken design; Enterobacter aerogenes; dark fermentation.

Biography

P. Karthic is pursuing his PhD at the age of 32 years from National Institute of Technology Calicut. He has published 4 papers in reputed journals and papers presented in National/International conferences. His areas of interest are bio-energy/bio-fuels and separation techniques.

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