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S K Verma

Birla Institute of Technology and Science-Pilani, India

Biosensor device to detect arsenic content in ground water

Intamination of groundwater due to the presence of various naturally occurring toxic elements in the sediments of earth's geographical clusters and effluents of industrial wastes has detrimental effects on the living of human life. Arsenic is one of the natural contaminants of groundwater widespread in Argentina, Bangladesh, Chile, China, Mexico, United States of America and in states of India like West Bengal, Odisha. Arsenic is a carcinogenic element commonly found in ground water wells in India and several other parts of the globe. The testing of millions of tube-wells requires a simple, portable and low cost field-test kits to monitor the levels of arsenic on a routine basis. Several field kits have been developed for this purpose thereby identifying the unsafe wells. However, the levels of precision and reproducibility of the data that they generate tend to be low. A portable, easy-to-use, low cost, and eco-friendly field test system is needed to monitor, on a routine basis, the levels of arsenic in drinking water procured from different tube-wells and open wells. This study presents a simple, battery-operated and low costper-test novel bio-electronic system based on fluorometric method to display the content of arsenic in water. In this method, a blue light of 480nm when incident on the EGFP protein based bio-sensor, the green florescence having wavelength of 520nm is emitted by the bio-sensor. The intensity of the green light increases with the increase in the content of arsenic present in water. The florescence of the green light is detected using a light-to-voltage converter, processed using ADUC841 micro-controller and the corresponding content of the arsenic at ppb level is displayed numerically on liquid crystal display (LCD). Validation of the arsenic detection system is compared against the results obtained from Perkin Elmer Wallac 1420 test kit. The experimental results show that the system can detect and display over a range from 0 to 100ppb with a resolution of 5 ppb.

Biography

S K Verma obtained Master's and PhD degree from Banaras Hindu University with specialization in Cyanobacteria and Applied Phycology. He worked as Post-doctoral fellow at University of Hyderabad in the area of Microbial and Molecular Genetics. Currently he is working as Professor of Biological Sciences and University Dean of Dean Academic Research Division at Birla Institute of Technology & Science, Pilani. He has handled several research projects related to bioremediation and biodegradation of toxic industrial waste, development of recombinant bacterial biosensor for environmental application, and biodiesel production by microalgae, funded by DAE, CSIR, UGC, DST, MoM. He has also worked as country expert on a project funded by WIPO Japan. He has published 35 research papers and filed two Indian patents. He has also guided eight PhD and over 40 Master's thesis.

skverma@pilani.bits-pilani.ac.in

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