Editorial

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Surface Water Pollution Detection and Management Using Nano Technological Applications

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Human activities such as the growth of urban and suburban regions, industry, urbanization, and agriculture make surface water very vulnerable to contamination. In reality, the most prevalent disposal locations for wastewater, which may contain germs, pharmaceutical waste, heavy metals, and dangerous contaminants, are sources of surface water. The Malaysian water quality standards and index were utilized as a reference benchmark for clean water. New nanomaterial-based approaches for water filtration and purification are attracting attention as more efficient ways for water pollution detection and treatment when compared to traditional wastewater treatment methods. Surface water is the primary source of water consumption for people, animals, and plants, prompting the usage of nanotechnology technologies to reduce pollution and quality. This article looked at how nanotechnology may be used to detect and remediate surface water contamination to ensure the long-term viability of a green environment. This study also discussed the use of nanotechnology in wastewater treatment, including Nano-filtration membranes, photocatalysis, plasma discharge, and Nano-adsorbents, as well as the use of Nano-sensors to monitor surface water quality. Because Nano-adsorbents have shown extraordinary effectiveness in the removal of pollutants in wastewater, including them into traditional technology may improve treatment efficiency. This review looked at the problems, opportunities, and future of nanotechnology in wastewater treatment. The findings provided in this work may open up new avenues for research into nanotechnology's potential uses for future surface water treatment.

Surface water, which includes lakes, dams, canals, rivers, and streams, is a valuable resource that provides three-quarters of the water used by agriculture and industry, as well as one-third of the drinking water used by private families. Despite its critical role in maintaining life, surface water is very vulnerable to contamination caused by unmanaged agricultural and industrial activity. According to the United Nations World Water Development Report 2015, 90 percent of sewage is thrown untreated into water bodies in underdeveloped nations. In addition, the industry annually disposed of 300 to 400 megatons of hazardous garbage in water bodies. The most frequent chemical contaminant found in groundwater aquifers is a nitrate, which is utilized in agriculture. Increased freshwater contamination and loss of clean water resources have resulted from industrial and home wastewater discharges. Surface water sources, such as rivers, are the most popular disposal sites for wastewater, which may include bacteria, heavy metals, and toxic compounds, due to their ease of access. Micropollutants are difficult and expensive to remove from surface water using traditional water remediation technologies, hence micropollutants in micro- or Nano-gram per liter continue to accumulate in the surface water. Heavy metals have been identified in fish from rivers as a result of the unchecked discharge of industrial effluents into surface water, posing possible health concerns to humans. Due to the unrestrained multiplication of bacteria, viruses, and fungus in water sources, underlying water pollution problems and inadequate water management may advance to even more catastrophic difficulties, such as large disease outbreaks. Unfortunately, traditional water treatment procedures are ineffective in removing a wide range of micropollutants from surface water.

Pesticides, surfactants, dyes, phenolic compounds, and new developing pharmaceutical pollutants have all been detected in water using various types of Nano-sensors. Nano-materials have several remarkable qualities in Nanosensor applications, including large surface area, fluorophore radiation for visual detection, antimicrobial activity, variable pore size, and reactive surface chemistry. Nano sensors' specificity, sensitivity, and detection limit in complicated wastewater are all hot topics in the study. To solve modern water pollution challenges, the ability to create Nano-sensors for identifying new pollutants is of great significance and need. Insights into future research objectives and problems are provided at the end of this review study. The goal of this review paper was to provide readers with information on current standards for determining surface water quality in a green environment, the types of contaminants found in surface water and their sources, an overview of conventional and nanotechnology wastewater treatments, water pollution detection, and the prospects of wastewater treatment technology. The goal of this review study was to help readers identify future research needs for the development of a more efficient, sustainable, and practical wastewater treatment system. The goals of this study were to (1) define surface water quality standards, (2) examine traditional water treatment methods, and (3) show the use of nanotechnology for surface water pollution treatment and detection, as well as the research gap. The knowledge gap between nanotechnology for water treatment research in the lab and the problems of up-scaling nanotechnology for large-scale water treatment applications was emphasized.

Various nanotechnology applications for surface water pollution and quality management have been researched and studied extensively. Due to intense human activity, surface water is prone to contamination. Surface water sources, such as rivers, are the most popular discharge sites for wastewater, which may include bacteria, heavy metals, and dangerous contaminants, due to their ease of access. These pure water supplies will be depleted over time, putting humans, animals, and plants in jeopardy. Traditionally, flocculation, coagulation, and biological treatments have been utilized to remove organic or inorganic contaminants. Traditional approaches, on the other hand, aren't completely effective, and they have several drawbacks when it comes to meeting the environmental-quality discharges requirement. As a result, numerous nanotechnology-based approaches for surface water treatment and quality control, such as Nano-filtration membranes, photocatalysts, plasma discharge, Nano-sensors, and Nano-adsorbents, hold considerable promise. Existing water treatment technology may now be combined with Nano-adsorbents, which have demonstrated great efficiency and selectivity in the removal of organic and inorganic contaminants. Despite nanotechnology's potential and optimistic application in surface water treatment, there remain several obstacles. Based on the future view, these problems might give possibilities and directions for further research on the application of nanotechnology in surface water treatment.