Smart Nanomaterials Technology

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Nanomaterials for Separation of Hazardous Contaminants from Wastewater

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Nanomaterials for the Removal of Dyes from Wastewater

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Abstract Dyes are frequently used to color objects in industries such as textiles, tanning, leather, cosmetics, and many more. These industries release huge amounts of wastewater that pose a risk to the environment and human well-being. Therefore, dye removal from contaminated water has received significant attention. For this purpose, adsorption and photocatalysis have been proven to be efficient and cost effective for removing dyes than the conventional biological, chemical, and physical processes. The utilization of nanomaterials through a combination of photocatalytic and adsorption has emerged to be an efficient method. The present chapter provides a comprehensive out-looks of dye removal treatment including their classification, toxicity, and dye elimination methods with especial focus on nanomaterials. Based on the reported date, it is established that nanomaterials have demonstrated significant dye removal potential to treat industrial wastewater.

Keywords Nanomaterials · Dye removal · Wastewater treatment · Adsorption · Photocatalysis

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with cost effectiveness, environmental safety, and large-scale production. To ensure the safe use and disposal of nanomaterials, future studies should also concentrate on their toxicity and long-term environmental fate. Nanomaterials have the potential to completely transform environmental remediation with further development, leading to cleaner water supplies and a healthier environment.

7 Conclusion

Nanomaterials have shown a promising and transformative approach for the removal of a wide range of dyes from wastewater. The exceptional properties of nanomaterials facilitate the efficient adsorption and degradation of dyes. Ongoing research work on nanomaterials for their scalable, cost-effective, and sustainable nanomaterial-based technologies holds great potential for significantly reducing the environmental impact of pollution due to dyes. The water pollution due to dye can be overcome by using nanomaterial through the physical, chemical, and biological techniques. However by combining, physical, chemical, and biological techniques, effective results can be obtained. To conclude, nanomaterial is very appealing for wastewater treatment applications because of their excellent characteristics with distinctive morphological and structural characteristics.

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