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Graphene quantum dot-based nanostructures for water treatment (Book Chapter)

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Abstract

Over the years, there has been an increase in the number of countries facing water stress and scarcity resulting from persistent high temperatures and prolonged dry conditions. These conditions result in an insufficient supply of clean water for human consumption and agricultural purposes. The situation is further compounded by water pollution by organic, inorganic, and microbial species that render some of the available water unusable. Therefore, there is a need to develop advanced water treatment technologies that can complement the current methods to ensure efficient water and wastewater treatment. Efficient treatment of wastewater is key in augmenting the fresh water supply and such water can also be used for crop irrigation, thereby reducing the demand for fresh water. This chapter presents a concise review of the application of various graphene quantum dot-derived nanostructures in water treatment. Such nanostructures have been explored in the catalytic removal of organic pollutants and inorganics as well as the abatement of microbial pollution. Furthermore, graphene quantum dot materials have been exploited as adsorbents as well as additives in membranes to improve water flux, rejection properties, and antifouling behavior. Graphene quantum dot-based nanostructures are promising materials toward water treatment to ensure adequate food supply and security.

Author keywords

Disinfection | Graphene quantum dots | Nanocomposites | Photocatalysis | Water pollution

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