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Review

Applications of chitin and chitosan based biomaterials for the adsorptive removal of textile dyes from water — A comprehensive review

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Chemical compounds studied in this article:
Cellulose (PubChem CID: 14055602)
Chitin (PubChem CID: 6857375)
Chitosan (PubChem CID: 71853)
Epichlorohydrin (PubChem CID: 7835)
Glutaraldehyde (PubChem CID: 3485)
Graphene oxide (PubChem CID: 124202900)
Montmorillonite (PubChem CID: 71586775)
Silica (PubChem CID: 190201)
Sodium hydroxide (PubChem CID: 14798)
Zeolite (PubChem CID: 131713223)

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ABSTRACT

The presence of pollutants in the water bodies deteriorate the water quality and make it unfit for use. From an environmental perspective, it is essential to develop new technologies for the wastewater treatment and recycling of dye contaminated water. The surface modified chitin and chitosan biopolymeric composites based adsorbents, have an important role in the toxic organic dyes from removal wastewater. The surface modification of biopolymers with various organics and inorganics produces more active sites at the surface of the adsorbent, which enhances dye and adsorbent interaction more reliable. Herein, the work brought in the thought of the application of various chitin and chitosan composites in wastewater remediation and suggested the versatility in composites for the development of rapid, selective and effective removal processes for the detoxification of a variety of organic dyes. It further emphasizes the existing obstruction and impending prediction for the deprivation of dyes via adsorption techniques.

1. Introduction

Water is an essential and inimitable natural resource on the earth, without which life of any kind does not exist. Water has a vital role in conserving the quality of life and earth ecology. Even though 71% of the earth's surface is covered by water, salinity makes 97.5% of water to be unfit for consumption due. In the 2.5% of remaining fresh water available, merely 0.27% of is available, as the rest of it is locked in the underground, polar ice caps, and marshes. Since the freshwater availability is not sufficient enough to satisfy the demands of existing population, water scarcity is accounted as a major issue in the present world (Boretti & Rosa, 2019; Singh, Shandilya, Raizada, et al., 2020). The ever increasing water demand, demographic explosion, in judicious use of water resources, inadequate rainfall, sudden climate variations and most prominently, water pollution leads to water scarcity. In the present era, water pollution is enlisted as one of the most extensively exasperating problems that require an instantaneous and realistic solution otherwise it would become a severe threat to sustainable environmental development (Veolia & IFPRI, 2015).

Rapid industrial developments, modern technology and population explosion pose various harmful effects on our environment. The agricultural, industrial and domestic wastes are directly discharged to the water streams. The discharge of the untreated industrial effluents, runoff from farmlands containing fertilizers and pesticides, pharmaceutical wastes, and domestic wastes dumped into the water bodies cause considerable adverse effects on living beings (Sirajudheen & Meenakshi, 2019). The effluents of the industrials hold a variety of organic compounds like dioxins, dibenzofurans, chlorophenols, polychlorinated biphenyls (PCBs), dyes, etc. The inorganic sources of pollutants include arsenate, chromate, other heavy metals, fluoride, nitrate, and

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