Synthesis of composite materials for the remediation of pharmaceuticals

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Abstract:

The progressive contamination of aquatic environments with pharmaceuticals raises increasing concern about their risks. As a matter of facts, growing amounts of pharmaceuticals accumulate to water bodies through various routes, such as improper disposal, excretion by humans and animals, and incomplete removal during wastewater treatment. Even at low concentration of these pollutants, the contaminated waters may cause significant problems to human health and to the environment, and increasing risks are posed by the inability of the conventional treatment plants to remove the more recalcitrant contaminants.

Scope of this study is the development of chitosan-based nanocomposites with superparamagnetic properties for a more efficient remediation of polluted wastewaters. Chitosan is an adsorbent material obtained from agro-industrial wastes, such as the chitin shells of shrimp. Consequently, the exploitation of chitosan is in line with the principles of the Circular Economy. The use of magnetic chitosan allows different advantages: easier separation to the spent adsorbent, reduced tendency to the aggregation and higher biocompatibility (Shaumbwa et al., 2021).

Kinetic and equilibrium tests have been carried out to characterize the adsorption of sulfamethoxazole, a recalcitrant pollutant widely occurring in rivers, lakes, groundwater, sediments and ocean (Prasannamedha et al., 2020). On the basis of the results obtained, suitable modifications of the magnetic chitosan have been carried out exploiting the abundance of functional groups on its surface. Molecular imprinting techniques have also been adopted to improce the efficiency of the adsorbent. Suitable regeneration procedures have been developed to ensure a long-term exploitation of the nanocomposites.

Keywords: wastewaters, pharmaceuticals, chitosan, adsorption, superparamagnetic nanoparticles, sulfamethoxazole

References:

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