CHITOSAN-BASED HYDROGELS FOR EFFECTIVE MICROPLASTIC ADSORPTION IN WASTEWATER TREATMENT

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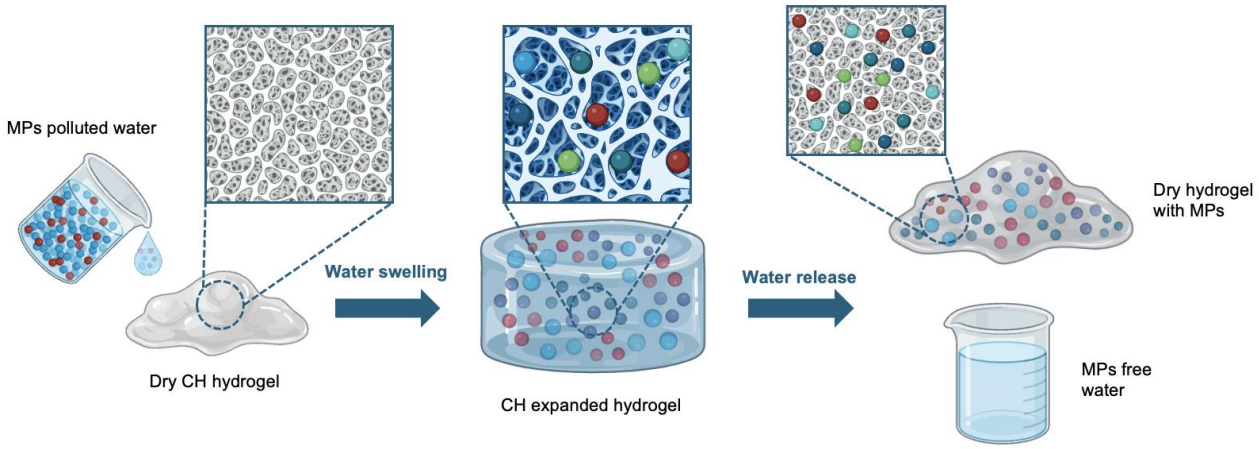
The excessive use of plastic materials and their improper disposal have led to the widespread presence of microplastics (MPs) in the environment, causing significant toxicological effects on both terrestrial and aquatic ecosystems. Due to their small size and large, chemically inert surface area, microplastics resist biodegradation and persist in the environment.
MPs have been detected within various aquatic organisms, entering the food chain and leading to a phenomenon known as bioaccumulation, which is a primary cause of human exposure. This exposure is particularly concerning due to the potential health effects of MPs on humans, including endocrine disruption, inflammation, and oxidative stress. Studies have shown that microplastics can adsorb toxic chemicals and pathogens, further amplifying their harmful impacts on human health [1]. Implementing effective water purification treatments is crucial to mitigating this type of exposure.
Hydrogels are known for their excellent water-holding capacity, high adsorption, reversible swelling, and biocompatibility, making them suitable for environmental remediation, particularly in water treatment. Recent research suggests that chitosan-based hydrogels (CH hydrogels) could offer a promising and cost-effective solution for improving the efficiency of wastewater treatment systems. CH hydrogels exhibit great hydrophilicity which contributes to their high water-holding capacity [2]. However, to effectively capture hydrophobic plastic particles, it is essential to incorporate recognition factors and hydrophobic components into the CH hydrogel structure to facilitate the interaction with plastic molecules.
In this work, we focus on optimizing the porous network structure of CH hydrogels to enhance their effectiveness in adsorbing PET MPs through both physical and chemical interactions. This optimization aims to make CH hydrogels a viable alternative to traditional treatment methods, potentially leading to improved environmental outcomes and a reduction in the ecological impact of MPs.



Key words: *Microplastic, Water, Hydrogel, Chitosan, Adsorption*

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