

Bio-sourced polymers with controlled properties

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Abstract

The **overall objective** of the PhD thesis refers to developing new innovative composite adsorbent structures based on natural polymers (chitosan, alginate) and fillers (inorganic-organic composite) with potential applications in the field of wastewater treatment bearing heavy metals. For this purpose, the research was divided into three specific objectives:

OS1. Chitosan synthesis from shrimp shell waste. The main aim of the first part was to optimize the synthesis of chitosan enriched with native calcium carbonate, starting from shrimp shell waste. The process aimed to synthesize a new type of chitosan with improved properties specifically for wastewater treatment applications.

The first aspect of thesis's originality is represented by the synthesis of this type of chitosan, starting from shrimp shell but enriched with native calcium carbonate by eliminating the demineralization step of chitin; a step characteristic of the conventional process of chitosan synthesis from crustacean shell.

OS2. The second specific objective of the thesis is the synthesis of inorganic-organic composites by approaching innovative host-guest polymerization method and the preliminary study on the composite's influence on the development of the synthesis protocol of hybrid polymer beads, and the determination of the adsorption capacity of the final materials.

The second aspect of the thesis's originality derives from obtaining inorganic-organic composites based on mesoporous titanium dioxide and acrylonitrile by the host-guest polymerization process.

OS3. The thesis's third specific objective is synthesizing chitosan-based hybrid beads incorporating the inorganic-organic compound for the retention of copper ions from aqueous solutions.

The third aspect of the thesis's originality is conferred by the synthesis of composite polymer beads by embedding the inorganic-organic composite within the matrix of chitosan enriched with native calcium carbonate and evaluating the adsorption capacity for heavy metals.