PHOSPHATE REMOVAL EFFICIENCY OF SIMPLE AND THERMALLY ACTIVATED MOLLUSK SHELLS

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Abstract

Chemicals from various industries are dumped in the form of residual water and can be harmful for living organisms if they exceed certain concentrations [1]. Therefore, finding new and improved methods for their extraction from wastewaters and subsequent reuse represents a perpetual scientific and technical objective. For example, less expensive methods are based on adsorption using cheap substrates, where the adsorbent has to fulfill a number of criteria, like selectivity, efficiency and low production cost.

Due to the high environmental risk sometimes posed by the huge amount of mollusk shells, naturally found on seashores or dumped as a result of food processing [2], a lot of interest was shown towards using these residues as useful natural cheap materials for building a circular economy. According to scientific literature, in some cases shells exhibit excellent metal adsorption properties. Their efficiency has been proven in both natural and modified form, *i.e.* by using thermal treatment, chemical treatment or added biomass [3].

This study involved the modification of Black Sea shells, which are commonly found on the Romanian shore, by using thermal treatment. Also, some preliminary results of phosphate removal efficiency from synthetic wastewater by the modified shells are presented. It was hypothesized that the thermal treatment increases the phosphate removal efficiency, so raw shells were tested for comparison.

The protocol involved the washing and drying of seashells, and their fragmentation to specific sizes. Fragments with certain dimensions were then isolated through sieving and used for further modifications and testing. The modification of shells' surface was performed by thermal treatment [3] and the results were evaluated by scanning electron microscopy. The phosphate removal efficiency was tested using synthetic water ran through a custom-made reactor of our own design and the results showed that both natural and modified shells are efficient. The best results were obtained for thermally treated shells when using the proper pH, which makes this material a promising path for wastes reintegration and reuse.

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