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Biopolymer Congress 2018: Two different routes for the preparation of bacterial cellulose/chitosan filtration membranes for copper removal in wastewaters - Leire Urbina - University of the Basque Country

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The presence of copper ions in wastewaters is a very serious problem extended in the electrical, leather, fungicidal or paper industries. Recent research is focused on the development of chitosan (Ch) membranes for wastewater purification processes since this biopolymer contains a large number of free amino groups which are highly reactive for the chelation reaction of metal cations. Traditionally, glutaraldehyde has been used as a cross-linker of Ch to improve the chemical and mechanical resistance of the membranes, but its main drawback lies with the toxicity, so other alternatives are being investigated. In this context, nanocellulose materials have also gained attention in this area due to their mechanical performance and high specific surface area. Bacterial cellulose (BC), a biopolymer biosynthesized by some bacteria, offers new possibilities in this field due to its highly crystalline 3D network-like structural conformation with excellent mechanical properties in wet state. In this work, environmentally friendly membranes by in situ and ex situ routes based on BC as a template for the Ch as functional entity for the elimination of copper in wastewaters have been developed. BC/Ch composites were prepared ex situ by immersing the previously biosynthesized BC wet membranes in 0.6 and 1% (v/v) Ch prepared in 0.5% acetic acid solution under shaking conditions. BC/Ch composites were prepared in situ by the supplement of chitosan (addition of 0.50 and 0.75% (w/v) Ch) into the culture medium used for the BC biosynthesis. The influence of the preparation route on the interactions between components, mechanical properties, morphology, and pore structure was evaluated. Two routes led to bionanocomposites with different aspect and physico-chemical properties. The morphological characterization suggested a better incorporation of Ch into BC matrix through the in situ route. Finally, the cooper removal capacity of these membranes was analyzed and the reusability of the membranes was assessed.

With the rapid development of industries, the scarcity of water resources, population growth, pollution of the surface and the groundwater, the toxic wastewater and the diseases that result in the need for increased wastewater. The removal of toxic heavy metal ions from wastewater, especially in industrial and mining waste effluents, has been widely studied in recent years. Heavy metal wastewater is released directly or indirectly into the environment, especially in developing countries. Heavy metals are not biodegradable unlike organic contaminants. Also they tend to accumulate in living organisms. Many heavy metal ions are known to be toxic or carcinogenic. Of particular concern for toxic heavy metals are the industrial wastewater treatment, which includes zinc, copper, mercury, lead and chromium.

Exclusive species of Cu (II) ions in freshwater resources and the osmo-regulatory mechanism of aquatic ecosystem damage in freshwater animals. The United States Environmental Protection Agency (USEPA) has set its own allowable limits for industrial effluents at 1.3 mg / L. Copper has been discharged from various industries such as metal cleaning and plating baths, paints and pigments, mining, smelting, petroleum refining, rinses such as brass, fertilizers, laon paste. printed circuits of wood and production. In addition, copper is phytotoxic and has been factored in as

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an algaecide to control algal blooms. Various processing technologies have been applied

Two pathways have led to bionanocomposites with different physical and chemical properties. The mechanical behavior in the wet state, strongly linked to the crystallinity and to the water retention capacity, was found to be very different depending on the preparation route, although the Ch content was very similar: 35 and 37 weights for membranes in situ and ex situ. Morphological characterization suggested better incorporation of Ch into the BC matrix by the in situ route. The copper removal capacity of these membranes was analyzed and the membrane prepared in situ showed the highest values, approximately 50%, for initial concentrations of 50 and 250 mgL -1. In addition, the reusability of the membranes was assessed.

Copper is one of the most precious and most used metals in the industry. There are many techniques for treating different types of industrial wastewater contaminated with heavy metals such as copper. Including adsorption, membrane filtration, cementation and electrodialysis, this article majorly focuses on the most advanced wastewater treatment techniques. The review examines the differences between treatment methods in terms of duration and overall effectiveness.