

ANTIMICROBIAL ACTIVITY OF A CHICKPEA STARCH BIOPOLYMER FUNCTIONALIZED WITH CU-AG NANOSPHERES

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In recent decades there has been spectacular development in the field of hybrid materials and especially metal-biopolymers, due to the possibility they offer of combining in a single material the properties of traditional biopolymers with those of some metals, to improve antimicrobial capacity. For this reason, the objective of this work is to combine the properties of Ag-Cu nanospheres with amylopectin and amylose biofilms from *Vicia faba* (dry bean) and study the effect of the particles on the physical, chemical and structural properties of the resulting membrane, especially the inhibitory effect on the growth of microorganisms. The chemical structure, morphology and optoelectronic properties of the materials in their different stages of formation were studied and characterized with qualitative and quantitative analysis methods. Chemical structure analysis was analyzed with a spectrophotometer in the range of 550-4000 cm⁻¹ by applying 100 scans. Morphological characterization was carried out by scanning electron microscopy and microstructure by optical microscopy. The crystal structure was analyzed by X-ray diffraction and the surface chemical states by X-ray photoelectron spectroscopy.

The *Vicia faba* amylopectin biofilm with Ag-Cu nanospheres is a material with multilayer morphology that combines the organic and inorganic part; The result is biodegradable films with semiconductor characteristics with possible conductive capacity. Now, according to this analysis, the components with the highest availability are C and O with atomic percentages equivalent to: 41.66% and 57.40%, for Cu and Ag they are 0.80% and 0.14% respectively.

The hybrid material obtained presents inhibition of microbial growth due to the antibacterial and antifungal property of silver and copper; It is observed that the antimicrobial effect of these nanoparticles increases with the concentration used, so this inhibition is probably due to the increase in interruptions generated by heavy metal nanoparticles on the surface of the cell membrane, thus generating poor functioning of cellular components such as DNA, lipids, peptidoglycans and proteins.

Keywords: Biopolymer, Antimicrobial inhibition, Ag-Cu nanospheres

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