OBTAINING NANOCOMPOSITES OF CHITOSAN WITH SELENIUM

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Chitosan, the cationic polysaccharide composed of randomly distributed (1,4)-linked 2-amino-2-deoxy-β-D-glucose units, a renewable natural extract obtained from deacetylation of chitin, is considered as a biodegradable, biocompatible, hydrophilic, non-immunogenic, and nontoxic cost-effective polymer, because it contains many reactive –OH and $–NH_2$ groups.

Thus, it is currently being intensively used in food, agriculture, nanobiotechnology, biosensing, pharmaceutics. Given all these characteristics, chitosan appears to be an ideal matrix to synthesize nanoparticles, which is deemed to be an environmentally friendly way. It has been utilized to fabricate Au, Ag, ZnS, and CdS nanomaterials. The NH_3^+ groups chitosan on the surface could interact with the phosphoryl groups of the phospholipid components in the cell membrane. As a result, the binding of the nanoparticles to the cell membrane enhances and increases their internalization.

Recently, there has been a growing interest in Se nanoparticles due to their high anti-cancer efficacy, antioxidant, low toxicity, and new therapeutic properties. Functionalized Se nanoparticles could be absorbed by cells via endocytosis pathways and cause apoptosis of cells through mitochondria. The coating of the surface of nanoparticles with biomacromolecules enhances their absorption into the cell and prevents their aggregation. For this purpose, nanocomposites were obtained to achieve selective cellular uptake of Se nanoparticles and increase their anti-cancer activities [1,2].

In our study, a nanocomposite of chitosan from *Apis mellifera* [3] and Se was obtained and the XRD method was used to study the crystalline structure (Fig.-1,2). At 2θ = 10º and 20º, semi-crystalline chitosan forms broad diffraction peaks that are characteristic fingerprint areas that are observed at 11.55º and 20.53º in the *Apis mellifera* chitosan [4].

Characteristic peaks in this area indicate that chitosan free amino groups formed intermolecular and intramolecular hydrogen bonds. The broad diffraction peaks of chitosan from *Apis mellifera* are due to its amorphous nature. According to the literature, grey selenium has a crystalline structure that forms strong and sharp peaks in the 2θ = 24º and 30º regions.

The CS-Se nanocomposites obtained in this research showed a broad peak at 2θ = 20º with no sharp Bragg reflections, which may demonstrate that through the redox system, the formation of CS-SeNPs exhibited an amorphous, not crystalline structure [5].

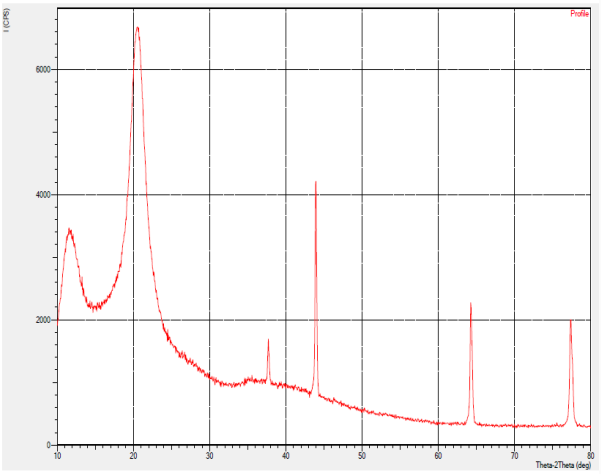

Fig.1. X-ray diffraction patterns of extracted chitosan

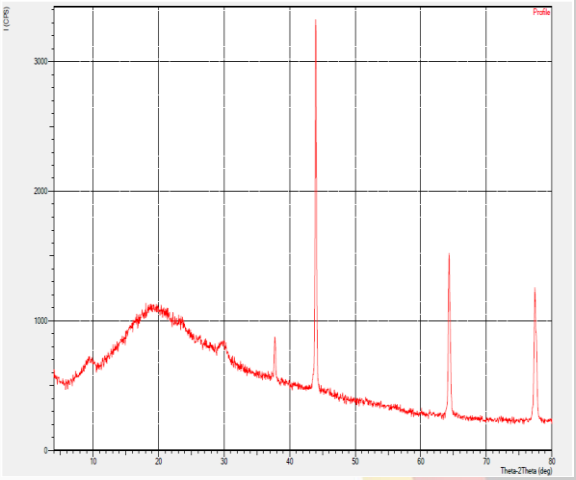

Fig.2. X-ray diffraction patterns of nanocomposite

References

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