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Physico-chemical analyses of distintc chitosan and their potential as quantum dots biocompatibilization agents

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Abstract – Chitosan is a policationic amino polysaccharide, obtained by chitin deacetylation from the exoskeleton of crustaceans, mainly. The variation of the chitin deacetilation degree (GD) result in different chitosan derivates, which influence various physical-chemistry properties, the application and the biological response of the polymer. The present work focuses on the study of the physical and chemistry properties of 3 commercial samples of chitosan, using scanner eletronic microscopy (Fig. 1), infra-red espectroscopy (Fig.2) and ray-X diffraction (Fig. 3), for using as marked biologycal functional agent in nanometric scale (*Quantum dots*). The results showed the Aldrich mark as he most promising in the nanoparticles conjugation.

Chitin is an insoluble linear β-1.4-N-acetyl-D-glucosamine (GlcNAc) polymer (1). This polysaccharide is naturally present in the cell wall of certain fungi, exoskeleton of crustaceans, insects and arthropods. Chitosan is a polymer obtained through the chemical deacetylation of chitin (3). These manipulations result in chitosan of a varying degree of deacetylation, which influence physical-chemical properties (3).
In this work, we present and discuss the results obtained by physical-chemistry analysis of 3 different kinds of chitosan (Aldrich, Heppe, Polymar), concerning their viability to act as funcionalizing agents of semiconductor quantum dots in biological media.
Several experimental procedures were used in order to perform chitosan samples characterization. Scanning electronic microscopy (SEM) and infrared spectroscopy were used to morphological and structural characterizantion, respectively. Deacetylation degree was determinated by elementar analysis. Cristalinity degree of the different samples was evaluated by X-Ray Diffractometry (XRD). SEM experiments shown relevant size dispersion between the different samples (as shown in Figure 1). Heppe chitosan (Figure 1b) presented the lowest size dispersion among the analyzed samples. Polymar chitosan (Figure 1c) presented the smaller particle size. All the samples presented vibrational profiles (see Figure 2) which do confirm the chitosan characteristic chemical composition. The XRD patterns of the analyzed sample is shown in Figure 3. Chitosan deacetylation degree was determined by Kassai´s equation (4). Among the analyzed samples the Aldrich chitosan presented the best features concerning its use as biocompatibilizing agents for semiconductor quantum dots in biological media.

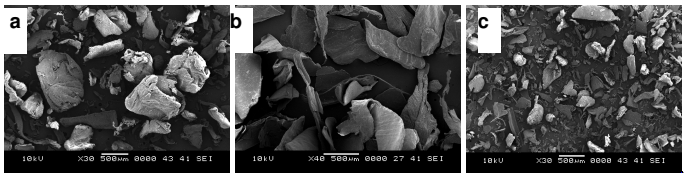

Figure 1: SEM images of samples chitosan **a)** Aldrich, **b)** Heppe, **c)** Polymar.

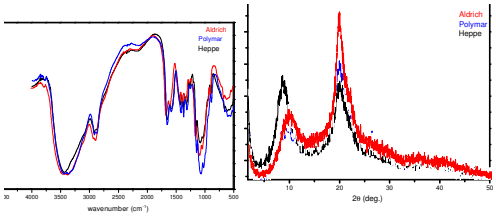

Figure 2: IR spectra of the analyzed chitosan samples.

Figure 3: XRD pattern of the analyzed chitosan samples.

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