

Preparation and Characterization of Chitin Whiskers from *Heterocarpus vicarius* shrimp wastes

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Abstract – Chitin whiskers have been prepared by hydrolysis and a combination of mechanical and ultrasonic disruption of chitin fibers, using commercial chitin and chitin from shrimp shell (*Heterocarpus vicarius*). Characterization was done by transmission electron microscopy (TEM), thermogravimetric analysis (TGA), atomic force microscope (AFM) and fourier transform infrared spectroscopy (FT-IR). The goal of this study was to obtain chitin nanocrystals as a new alternative to use shrimp shells produced in Costa Rica.

Shrimp wastes represent an environmental problem in Costa Rica. Our group has been working in the utilization of shrimp wastes as a source of chitin. On the other hand, there has been an interest in the development of new materials possessing nano-structural morphologies in order to be used in advanced biomaterial applications. Chitin whiskers might be used as possible filler materials in bionanocomposites because of properties such as biocompatibility and biodegradability.

Chitin whiskers were prepared based on the methods of Sriupayo *et al.* [1], Phongying *et al.* [2] and Goodrich *et al.* [3]. Chitin whiskers were prepared from shrimp shells (*Heterocarpus vicarius*), and commercial chitin, and then both were isolated and characterized.

Both types of chitin were hydrolyzed using a hydrochloric acid solution at 90°C with magnetic stirring. Once the hydrolysis process was finished, chitin acid solutions were centrifugated, re-suspended, dialyzed and subjected to sonification. Finally, a white solid powder was isolated after freeze drying in each case.

TEM was used to characterize the nature of the chitin whiskers that showed a needle-like shape, and with lengths and diameters of about 1 and 0.2 nm, respectively, as seen in Figure 1. FTIR analysis was used to calculate the degree of acetylation of chitin, AFM was used to study the nanoscale surface of the whiskers and TGA was applied to identify the degradation temperature of the chitin whiskers.

According to the results, the use of shrimp shell wastes is an option to reduce their environmental impact as well as an alternative to obtain value added products.

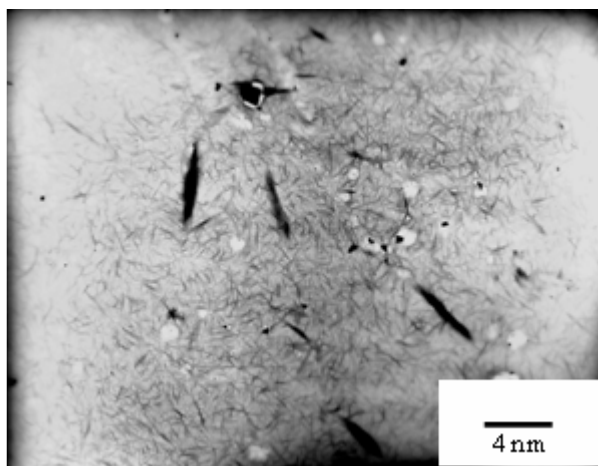


Figure 1: TEM image of chitin whiskers produced from commercial chitin.

[1] Sriupayo J.; P. Supaphol; J. Blackwell; R. Rujiravanit; Carbohydrate Polymers. 62,(2005) 130-136.

[2] Phongying S.; S. Aiba; S. Chirachanchai; Polymer. 48 (2006) 393-400.

[3] Goodrich J.; W. Winter; Biomacromolecules. 8 (2006) 252-257.