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Extraction of chitosan from shrimp shell waste – to grind or not to grind?

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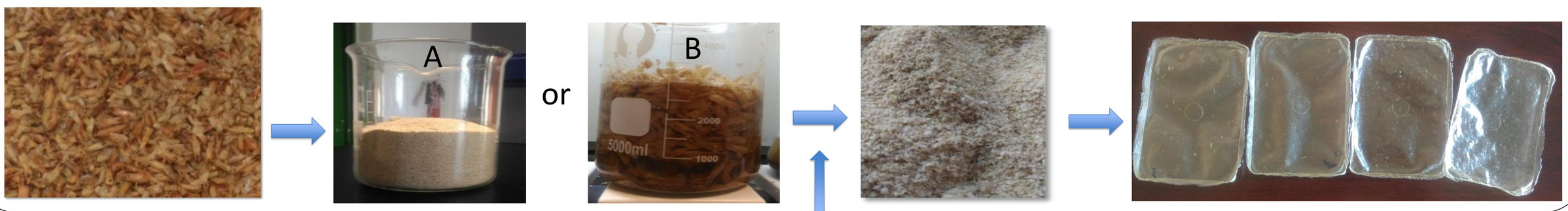
Introduction: Chitosan is a semi-natural biopolymeric material produced from chitin, which is the second most abundant biopoloymer (after cellulose). Chitin is found in the exoskeleton of insects, marine crustaceans and certain fungi and algae. The most abundantly available raw materials are shells of crab, shrimp and prawn.

Objective : The work reported here concerns extraction of chitin from Egyptian shrimp shells, its conversion to chitosan and the production of chitosan films (with a view to making non-biomedical products such as degradable packaging).

Commonly dried shrimp shell are mechanically ground before starting the extraction process. However in this work we explored the effect of using the shells ground (method A) or leaving them whole (method B).

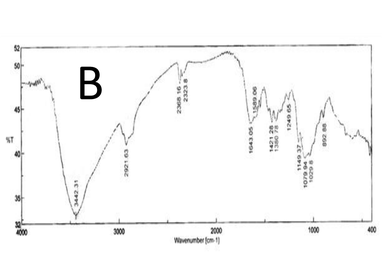
Method:



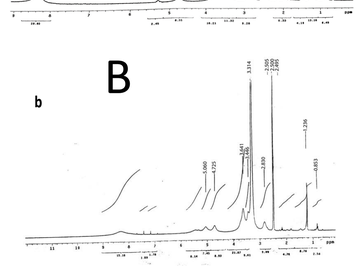
Chitosan production: The production of chitosan from marine crustacean shells involves 3 main steps:
1. Deproteinisation in alkali (we used NaOH), 2. Demineralisation in acid (we used HCl) and 3. Deacetylation in alkali (we used NaOH). Then we ground and dissolved the chitosan in order to solvent cast films.

Results:

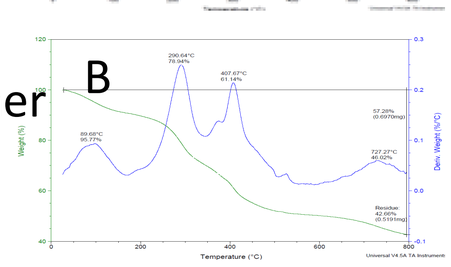
FTIR spectrums confirm chitosan and indicate that method B gives higher crystallinity.



NMR spectroscopy data shows that the degree of deacetylation is higher for method B.



TGA scans show that samples from method B showed higher thermal stability.



Conclusion: Using the whole shells removed a step in the production process whilst producing chitosan with higher crystallinity, a better degree of deacetylation and greater thermal stability.

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