# UNDERSTANDING THE BEHAVIOR OF CHITIN IN SUBCRITICAL AND SUPERCRITICAL WATER IN A CONTINUOUS REACTION SYSTEM

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## Abstract

After cellulose, chitin is the second most widespread biopolymer worldwide. Its best-known applications, thanks to its antibacterial, toxicological and biocompatibility properties, are oriented to the medical and pharmaceutical industry, cosmetics, agriculture, and water treatment, among others. Being a biopolymer, chitin is formed by [β-1,4-poly(n-acetyl-D-glucosamine)] units, which can be treated to obtain oligomers and monomers, N-acetylglucosamine (depolymerization) and glucosamine (deacetylation). These monomers constitute nitrogen containing building blocks that open the way to sea-waste biorefinery for obtaining molecules of interest, such as furan-based monomers or amines[1]. Studies have shown that chitin, like cellulose, can be dissolved and hydrolyzed in sub- and supercritical water; however, due to its high crystallinity, this process occurs less easily[2]. Processes studied have used sub- and supercritical technology in batch-type systems as pre-treatments in enzymatic processes, managing to dissolve and even obtain monomers in times of up to 1 minute[2]. However, degradation compounds have been obtained or even the prevalence of side reactions competing with hydrolysis has been observed (depending on the reaction conditions).

The present work shows the behavior of chitin in subcritical and supercritical media, seeking to understand the effect of water properties (density, viscosity, ionic product) at conditions surrounding the critical point; specifically, to investigate the reaction mechanism of chitin in SubCW and SCW media using ultrafast continuous reactors. Commercial chitin was characterized by elemental analysis, FT-IR, XRD to sketch a picture of the starting structure for the reaction process. The reaction process was carried out in sub and supercritical water (P= 250 bar, T= 350 °C to 390 °C) and short reactor residence times (0.3s to 12s). Unlikely the behavior of cellulose in sub/supercritical water in ultrafast reactors, the products obtained were solid suspension in all the experiments. Liquid fraction was characterized by Total Organic Carbon, Total Nitrogen and HPLC; and solid fraction was characterized by elemental analysis, FT-IR and XRD.

*Keywords: Chitin, SCW Hydrolysis, N-acetyl glucosamine, Glucosamine, ultrafast reactors.*

*References:*

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*Acknowledgements:*

*This work was supported by Spanish Ministry of Science and Innovation (project PID2020-119481RA-I00), the Regional Government of Castilla y León and FEDER-EU, program CLU-2019-04.*