

Hydroxyapatite and chondroitin sulfate from *Prionace glauca* shark jaw: Physicochemical and structural characterization

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May 5, 2020

Abstract

In the present work, the potential of the blue shark (*Prionace glauca*) jaw as a source of both bioapatite and chondroitin sulfate is explored. A chemical and structural characterization of this fishing by-product by Scanning Electron Microscopy (SEM), Electron Dispersive Spectroscopy (EDS), FT-Raman spectroscopy and X-Ray Diffraction (XRD) was carried out. The sandwich-type structure in cross section of the jaw based on alternate layers with prevalence in mineralized or organic tissue is shown and these bands respectively confirmed as hydroxyapatite (HA) or CS-enriched zones. As result of this, an optimized process in sequential steps for the recovery of both biomaterials and their purification process is proposed, by combining enzymatic proteolysis, chemical precipitation and separation using ultrafiltration membrane for CS production together with controlled thermal treatment for hydroxyapatite obtaining. The purified CS was characterized by Gel Permeation Chromatography (GPC), Nuclear Magnetic Resonance (NMR) and Strong Anion Exchange Chromatography (SAX-HPLC), revealing a polymeric material with a molecular weight of 67kDa and prevalent 6S-GalNAc sulfation (68%), followed by 4S-GalNAc (13%), a significant proportion of disulfated disaccharides (12%) and only 7% of non-sulfated units. In the case of the bioapatite a purified biphasic 60:40 porous calcium phosphate of hydroxyapatite: whitlockite/ β -TCP was confirmed. Hydroxyapatite as major component (85%) was also obtained for jaws directly subjected to the thermal treatment. This proved the influence of the enzymatic hydrolysis and centrifugation on the composition of the mineral fraction.

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