

Valorisation of Whitefin Wolf-Herring Bone Waste into Nanohydroxyapatite Via Ultrasonic-Assisted Processing

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Abstract

Hydroxyapatite (HAp) is a leading bioceramic for orthopedic applications due to its similarity to bone mineral. Traditional synthesis methods are energy-intensive and rely on chemical precursors. This study addresses these concerns by converting underutilized marine waste, specifically *Chirocentrus nudus* fish bone, into high-value nanocrystalline HAp via calcination followed by ultrasound-assisted process. This work contributes to circular economy practices by valorizing biowaste. Design of Experiment was applied to involve the variables including frequency (kHz), power (W) and time (min). The optical microscopy images showed the morphology change during the process, where heterogeneous morphology, monodisperse spherical particles and nano HAp were obtained. The particles size became smaller when operate with a higher power and longer time, while frequency (37kHz) can break down particles to smaller size. The FTIR results revealed that with increasing the ultrasonic duration with the same power and frequency, the higher crystallinity degree was recorded and biphasic calcium phosphate was formed. This sustainable approach utilizes fish bone waste to produce nanosized HAp for different biomedical application.

Keywords

Hydroxyapatite, Bioceramics, Ultrasonication, FTIR, Microstructure.