Toward the Shell Biorefinery: Processing Crustacean Shell Waste Using Hot Water and Carbonic Acid

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Abstract

Biomass fractionation is a prerequisite for almost any biorefinery process. Yet, a cost-effective and environmentally benign approach to separate biomass feedstock into valuable fractions remain a challenge. Herein we introduce a new fractionation method to extract high value chitin from crustacean shell (e.g., shrimp shell) using hot water for deproteinization and carbonic acid for demineralization (termed as the HOW-CA process). This method features high deproteinization and demineralization efficiencies (>90%), and the whole process is accomplished within hours. The desired final product chitin exhibits a high purity. This work addresses the major problems associated with the current industrial practice including the employment of corrosive reagents, the destructive removal of a useful component, and the generation of a large amount of waste. Economic and life-cycle analyses imply that the HOW-CA process is superior to the conventional method, offering both economic and environmental benefits.

Keywords

Author Keywords: Chitin; Shrimp shell; Deproteinization; Demineralization; Hot water treatment; Life-cycle analysis
KeyWords Plus: GREEN CHEMISTRY; SHRIMP SHELL; CHITIN; CONVERSION; EXTRACTION; CELLULOSE; POLYOLS

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