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Preparation of Chitin-based Nanomaterials by Gas Bubbling-Ultrasonic Treatments

Kohei TANAKA, Kazuya YAMAMOTO, Jun-ichi KADOKAWA

Graduate School of Science and Engineering, Kagoshima University

Abstract

Chitin is one of the most abundant biomass resources. Although the construction of nanostructures is an efficient method for chitin materialization [1], they generally tend to aggregate by drying [2]. In this study, we found that nanowire network structures were constructed from chitin derivatives by gas bubbling-ultrasonic treatments in water. Furthermore, we also have paid attention to an amidine group to develop chitin nanowire network with re-construction property because the group reversibly changes to the amidinium bicarbonate under CO_2 atmosphere [3]. When chitin was first subjected to N_2 gas bubbling-ultrasonic treatments in water, the SEM image showed that nanowire network structure was constructed (Figure 1a). Then, a partially deacetylated chitin (PDA-chitin) was prepared by deacetylation of acetamido groups of the product under alkaline conditions [4]. Amidine groups were introduced by the reaction of primary amines in PDA-chitin with *N*,*N*-dimethylacetamide dimethyl acetal. After the amidinated chitin was subjected to CO_2 gas bubbling-ultrasonic treatments in water, the SEM image showed that nanowire network structure was remained. We examined re-nanostructuralization of the aggregated material, which was obtained by drying under reduced pressure. Consequently, the material was re-nanostructured by ultrasonic treatment in water (Figure 1b). This behavior was probably caused by the electrostatic repulsion of amidinium bicarbonates [5].

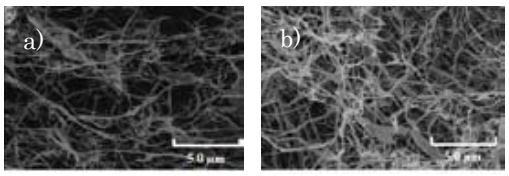

Figure 1. SEM images of chitin after N_2 bubbling and ultrasonic treatments (a) and amidinium chitin after re-nanostructuration (b).

References

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