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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 CO₂ atmosphere [3]. When chitin was first subjected to N₂ 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 CO₂ 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].

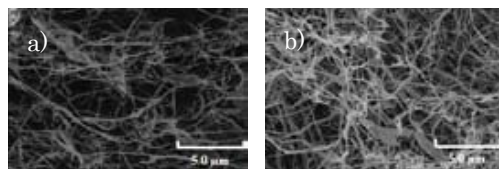


Figure 1. SEM images of chitin after N₂ bubbling and ultrasonic treatments (a) and amidinium chitin after re-nanostructuralization (b).

References

- 1) Y. Fan, T. Saito, A. Isogai, *Biomacromolecules*, 2008, 9, 192–198.
- 2) S. Ifuku, M. Nogi, M. Yoshioka, M. Morimoto, H. Yano, H. Saimoto, *Carbohydr. Polym.*, 2010, 81, 134–139.
- 3) Q. Zhang, W. Wang, Y. Lu, B. Li, S. Zhu, *Macromolecules*, 2011, 44, 6539-6545.
- 4) S. Phougying, S. Aiba, S. Chirachanchai, *Polymer*, 2007, 48, 393-400.
- 5) K. Tanaka, K. Yamamoto, J. Kadokawa, *Carbohydr. Res.*, 2014, 398, 25-30.