Global Congress & Expo on Materials Science & Nanoscience
October 24-26, 2016 Dubai, UAE

Surface Modification and Material Processing of Self-assembled Chitin Nanofibers

Keisho Iimori, Ryo Endo, Kazuya Yamamoto, Jun-ichi Kadokawa

Abstract

Chitin is a natural aminopolysaccharide and an important renewable resource comparable to cellulose. However, it has been difficult to provide practical material applications from chitin, due to lack of solubility and processability. Derivatization of chitin is considered as one of the efficient methods for its materialization. Recently, we found that an ionic liquid of 1-allyl-3-methylimidazolium bromide (AMIMBr) dissolved or swelled chitin [1)], which was also used as a solvent for acetylation of chitin with acetic anhydride under mild conditions. Furthermore, we found that self-assembled chitin nanofiber film was obtained by regeneration from the chitin ion gel with AMIMBr using methanol, followed by filtration [2)]. In this study, we performed surface modification of the self-assembled chitin nanofibers by acetylation and their composite fabrication with commodity plastics, polyethylene. First, we prepared the self-assembled chitin nanofiber / DMF dispersion by regeneration from the chitin ion gel using methanol, followed by exchange of dispersion media to DMF. Surface acetylation of the products was performed by reaction with acetic anhydride for 12 h at r.t. in the dispersion. The resulting dispersion was subjected to filtration to obtain a partially acetylated chitin nanofiber film. The resulting film showed adhesive property with polyethylene. On the other hand, the original chitin nanofiber film didn't show adhesive property with polyethylene. Then, the composite with low density polyethylene was fabricated by pressing at 170 ^{o}C. The SEM measurement of the product observed the morphology that polyethylene covered nanofibers.

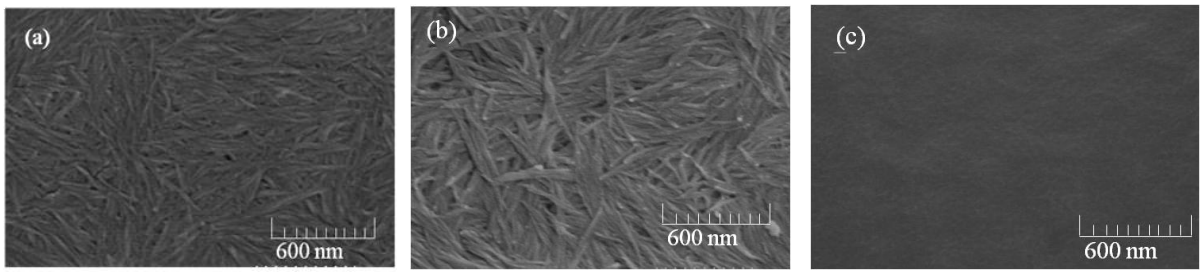

Figure. SEM images of chitin nanofiber film (a), partially acetylated chitin nanofiber film (b) and partially acetylated chitin nanofiber / polyethylene composite film (c)

Reference

1) K. Prasad, M. Murakami, Y. Kaneko, A. Takada, Y. Nakamura, J. Kadokawa, *Int. J. Biol. Macromol*., **45**, 221 (2009).
2) J. Kadokawa, A. Takegawa, S. Mine, K. Prasad, *Carbohydr. Polym.*, **84**, 1408 (2011).

Department of Chemistry, Biotechnology, and Chemical Engineering, Graduate School of Science and Engineering, Kagoshima University, Kagoshima 890-0065, Japan