Abstract

[Project Information]

Project Title : Development of Fabrication Route of Environment-Friendly Polysaccharide Particles

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Principal Investigator : Yukiya Kitayama

(PI ORCID) : 0000-0002-7418-301X

Principal Institution : Osaka Metropolitan University
1-1, Gakuen-cho, Naka-ku, Sakai, Osaka, JAPAN
Tel: +81-72-254-9330
E-mail: kitayama@omu.ac.jp

Cooperated by :

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[Abstract]

Polymer capsules are widely used in the various industrial fields such as cosmetics and fragrances. However, the many of the polymer capsules used up to date are generally non-degradable and easily dispersed in the river and oceans, resulting in the microplastic pollution. Thus, development of the degradable polymer capsules is quite important. Previously, we have developed the interfacial photocrosslinking approach as a new synthetic route of the functional polymer particles, where the [2+2] photodimerization reaction occurred between the photoreactive polymer side chains only at the particle interface [1-2]. The non-reactive polymers can be easily removed from the shell-crosslinked polymer particles, yielding the hollow polymer particles.

In this study, we attempted to develop a new technology for creating structurally functionalized biodegradable polymer particulate materials by synthesizing new photoreactive polysaccharides, which were entirely made from plant-derived molecules. Specifically, polysaccharide polymer particles were synthesized by introducing cinnamate groups, and photoirradiated to induce a photocrosslinking reaction at the interface. Subsequently, the hollow particles were obtained by removing the unreacted polysaccharides, where the formation of hollow polysaccharide particles were confirmed by optical microscopy and scanning electron microscopy. It was also clarified that low-molecular-weight compounds and macromolecules can be stably encapsulated in the voids inside the hollow particles, and that polysaccharide polymer capsules encapsulating various molecules can be obtained. In addition to their hydrolytic and photodegradability, the polysaccharide polymer capsules were shown to be biodegradable, based on the results of biodegradability tests using activated sludge. These research results were reported through intellectual property rights, academic papers, and conference presentations. Through these series of

researches, we have not only created biodegradable polysaccharide particulate materials that can contribute to solving the marine microplastic problem by breaking away from non-biodegradable polymer particle materials, but also established an innovative technology that can realize structural functionalization of biodegradable glycopolymer particles.

[References]

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