高靭性・高耐水性バイオマス材料の開発を目指した多糖類とアパタイトの複合化とそのアシル化

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Hybridization and acylation of polysaccharide and apatite applicable to highly tough and highly water resistant biomass materials ([1]*Graduate School of Science and Engineering, Doshisha University*, [2]*Sanwa Starch Co., Ltd.*) ○Kohei Okuda,[1] Tatsuya Tano,[1] Tadashi Mizutani,[1] Yasuhiro Aoyama[2]

Phosphorylated tapioca starch and hydroxyapatite were hybridized by the coprecipitation process and the composites were acetylated, hexanoylated, lauroylated, benzoylated by reacting with each vinyl carboxylate with the aim of developing a new tough biomass material by imitating bone. FT-IR study revealed that the higher the acylation temperature, the larger the absorbance ratio of the carbonyl group / HAP phosphate group of each acyl group, i.e., the acylation proceeded more rapidly (Fig. 1). The bending strength of the composites before acylation was 42 MPa, but after water soaking, it swelled and the mechanical properties decreased significantly. When the composite was hexanoylated, lauroylated or benzoylated at temperatures above 80 °C, the bending strengths were maintained up to about 60% even after soaking, and there was no swelling (Fig. 2). The water resistance of the composites improved dramatically.

Keywords : Starch; Hydroxyapatite; Acylation; Biomass; Water resistance

骨の模倣による高靭性・高耐水性バイオマス材料の開発を目指し、リン酸化タピオカデンプンとヒドロキシアパタイト（HAP）を共沈複合化[1]し、これをカルボン酸ビニルと反応させ、アセチル化、ヘキサノイル化、ラウロイル化、ベンゾイル化などのアシル化を施した。FT-IR の結果、Fig. 1 のとおり、アシル化温度が高いほど各アシル基のカルボニル基/HAP のリン酸基の吸光度比が大きく、よりアシル化が進行した。アシル化前の曲げ強度は 42 MPa であったが、浸水によって膨潤し、機械的性質は著しく低下した[2]。80 °C 以上でアシル化された複合体は、Fig 2 のとおり、浸水後も曲げ強度は 60 %程度まで保たれ、膨潤もせず、複合体の耐水性は飛躍的に向上した。

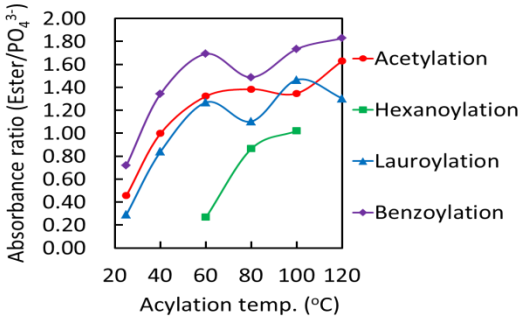

Fig. 1. Effects of acylation temperature on the absorbance ratio of ester group / HAP phosphate group of the composites in FT-IR

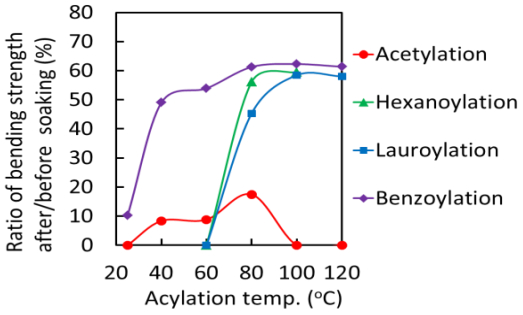

Fig. 2. Effects of acylation temperature on the ratio of bending strength before and after soaking of the acylated composites

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