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## Synthesis, properties, and structure of alternating copolymers of 3-hydroxybutyrate and lactate units

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We focused the structure and physical properties of alternating copolymers consisting of  $\alpha$ -hydroxyl acid monomeric unit of lactate (2-hydroxypropionate: 2HP) and  $\beta$ -hydroxyl acid monomer unit of (*R*)-3-hydroxybutyrate ((*R*)-3HB). Taking into account the chiral structure of monomeric units, two types of stereoisomeric dimers ((*R*)-3HB-(*R*)-2HP and (*R*)-3HB-(*S*)-2HP) were respectively prepared, and the alternating copolymers with different stereocompositions were synthesized from the dimeric monomers by condensation reaction. Based on the NMR analyses, it was confirmed that the obtained copolymers had an alternating sequence of (*R*)-3HB and 2HP units. In contrast to random copolymers of (*R*)-3HB and 2HP units, the repeating sequence of alternately connected (*R*)-3HB and 2HP units formed crystalline region. The copolymer with alternating sequence of (*R*)-3HB and (*S*)-2HP units had a melting temperature at 83°C. On the other hands, the melting temperature of copolymer of (*R*)-3HB and (*R*)-2HP units was quite higher than those of the corresponding homopolymers (around 180 °C) and reached to 233°C. When the alternating copolymers were prepared from a mixture of stereo isomeric dimers both the melting temperature and crystallinity varied in the wide ranges depending on the composition of stereoisomeric dimers. In addition, the crystalline structure of alternating copolymers was characterized from the X-ray and electron diffraction patterns of lamellar single crystals. The relationship between the crystalline structure and thermal properties in the alternating copolymers were discussed.

### Biography

Hideki Abe received his PhD degree in 1996 from Tokyo Institute of Technology. Since 1993 he has been working at the Polymer Chemistry Laboratory of RIKEN. He successively held various positions in RIKEN, and was promoted to Team Leader of Bioplastic Research Team, RIKEN Biomass Engineering Program, in 2010. His current research interests include the developments of biodegradable polymer materials for a variety of applications and the creations of novel bio-based polymer materials. He published over 100 original research papers.

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