Proc. KSAM International Symposium
June 20-22, 2001, Chonan, Korea

Metabolic Engineering of *Escherichia coli* for the Production of Novel PHA Polymers and Chiral Compounds

Sang Yup Lee, Si Jae Park, and Young Lee
Metabolic and Biomolecular Engineering Nat Res Laboratory
Department of Chemical Engineering and BioProcess Eng Res Center
Korea Advanced Institute of Science and Technology

Polyhydroxyalkanoates (PHAs) are a group of microbial polyesters which can be used as completely biodegradable plastics and elastomers. Various (R)-hydroxycarboxylic acids can be incorporated into the PHAs by employing different carbon sources and modifying metabolic pathway. Metabolic engineering strategies were developed to produce a novel class of PHAs, which show much superior material properties. One of these polymers, poly(3-hydroxybutyrate-co-3-hydroxyhexanoate), was found to possess properties very similar to low density polyethylene, but is completely biodegradable after disposal. Detailed strategies applied for the strain development and for the fermentative production of these interesting biopolymers will be presented. (R)-(-)-hydroxycarboxylic acids can be widely used as chiral building blocks for the synthesis of fine chemicals such as antibiotics, vitamins, aromatics and pheromones. It contains a chiral center which can be used to synthesize new compounds, and also contains two functional groups (OH and COOH) which are convenient to modify. Unfortunately, preparation of enantiomerically pure (R)-hydroxycarboxylic acids by chemical synthesis is difficult and uneconomical. Novel metabolic engineering strategies as well as *in vivo* depolymerization strategies employed for the production of various enantiomerically pure (R)-hydroxycarboxylic acids will be presented.