One-step Biosynthesis of Poly(D-lactate-*co*-glycolate-*co*-4-hydroxybutyrate) from metabolically engineered *Escherichia coli*

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Currently, it is necessary to develop sustainable biomaterial to replace conventional petroleum-based plastic causing severe environmental pollution. Poly(lactate-*co*-glycolate) (PLGA) is the representative thermoplastic polyester generally used for biomedical and therapeutic field with its biodegradability and biocompatibility. Poly(lactate-*co*-glycolate-*co*-4-hydroxybutyrate) (PLGA-4HB) as the PLGA copolymer shows the enhanced material properties and much extensive practicality. In this study, *Escherichia coli* was metabolically engineered to produce PLGA-4HB efficiently which exhibit various material properties derived from different monomer composition. Feeding 4HB was tested to produce the terpolymer, and expression of the six heterologous genes was optimized to produce it without precursor feeding. For analysis of thermal and mechanical properties as well as molecular weight, characterization of PLGA-4HB (3.4-41 mol% of 4HB) was conducted to suggest its versatility including medical application. The final strain successfully produced PLGA-4HB and PLGA-4HB-2HB from glucose and xylose, showing titer of 6.19 g/L and polymer content of 65.76 wt% in fed-batch fermentation.