

Effect of Addition of Sodium Propionate or Sodium Valerate on Continuous Production of Poly(hydroxybutyrate-co-hydroxyvalerate)

李志章、洪瑞澤；余世宗

E-mail: 9511027@mail.dyu.edu.tw

ABSTRACT

Polyhydroxyalkanoate, a kind of biodegradable plastics, can be biosynthesized by various microorganisms, and possesses physical properties similar to conventional plastics such as polypropylene. Especially, polyhydroxybutyrate (PHB) and poly(hydroxybutyrate-co-hydroxyvalerate) (PHBV) are two polymers frequently brought much attention. *Ralstonia eutropha* can produce PHB with a simple carbon source. For instance, glucose can be used as a sole carbon source to produce PHB. If organic acidic substrates, such as sodium propionate and valerate, are used to be the second carbon source, *R. eutropha* can produce PHBV. However, if the concentration of sodium propionate or valerate is too high, the microbial growth of *R. eutropha* may be refrained. In this study, PHB(V) was produced by *R. eutropha* (ATCC 17699; BCRC 13036) that was cultivated in a continuous fermenter in a phosphorus-limiting condition. The major carbon source was glucose (20 g/L), the nitrogen source was (NH₄)₂SO₄ (10 g/L) and the phosphorous sources included Na₂HPO₄ (0.1 g/L) and KH₂PO₄ (0.2 g/L). At 30 °C, PHB was biosynthesized by *R. eutropha* with a concentration of 2.19 g/L which was about 33% of the total biomass. As the carbon substrate was depleting, the biomass increased a little, but the PHB was decreasing. In the other two experiments, the second carbon source (sodium propionate or valerate) was added in the feed in order to produce PHBV. When the medium containing 5 g/L sodium propionate, PHBV (13.2% HV and 86.6% HB) was biosynthesized with a concentration of 2.1 g/L, and was about 31.8% of the biomass (6.79 g/L). When the medium containing 5 g/L sodium valerate, PHBV (containing 47% HV and 53% HB) was biosynthesized with a concentration of 1.61 g/L, and was about 25.9% of the biomass (5.94 g/L). Comparison of these two cases revealed that adding sodium valerate in the feed would raise the ratio of HV in the PHBV.

Keywords : PHBV ; *Ralstonia eutropha* ; phosphorus-limiting condition ; continuous fermenter ; sodium propionate ; sodium valerate ; dilution rate

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