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Production of poly-3-hydroxybutyrate and oxygen transfer characterization by *Azotobacter vinelandii* in a 30L bioreactor

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Polyhydroxybutyrate (PHB) is a biopolymer produced by *Azotobacter vinelandii*. The PHB is a biodegradable thermoplastic material, used in packaging production, drug encapsulation and medical implants. The objective of this work was to develop a PHB production process in 30L bioreactor. Cultures of *A. vinelandii* OP were performed in batches in an Infors HT stirred tank reactor model Techfors-S with 20L of culture medium composed of sucrose as a carbon source and yeast extract as nitrogen source. The culture was developed at 100 rpm, 1 vvm, 30 °C and pH 7.1 controlled with 2N NaOH. The Dissolved Oxygen Tension (DOT) was characterized with a polarographic sensor and the Oxygen Transfer Rate (OTR) was estimated by analyzing O₂ and CO₂ in the gas phase. The results show that the biomass reached a maximum value of 7.5 g L⁻¹ after 70 hours of cultivation. Sucrose was completely consumed, indicating that it was the nutrient limiting growth. The DOT remained at values close to zero during the cell growth phase and the OTR reached a constant maximum value for 30 hours, reaching 10 mmol L⁻¹h⁻¹. This OTR behavior is typical of oxygen-limited cultures. The concentration of PHB was increased during cell growth, until reaching a maximum concentration of 6.0 g L⁻¹. Likewise, the percentage of intracellular accumulation of PHB varied between 65% and 82% between 35 and 50 hours of culture. Results of PHB are like that reported by Millán et al., in 2017 with percentages of accumulation of constant PHB over 70%. Y_{PHB/S} of 0.24 gg⁻¹ with q_{PHB} of 0.01 gg⁻¹h⁻¹. Our results have demonstrated it was possible to develop a PHB production process on a 30L scale getting PHB concentrations of 6 g L⁻¹. Furthermore, by characterizing the oxygen transfer it is possible to explain the high percentage of PHB accumulated by *A. vinelandii*.

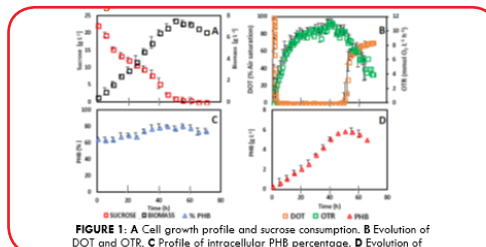


FIGURE 1. A Cell growth profile and sucrose consumption. B Evolution of DOT and OTR. C Profile of intracellular PHB percentage. D Evolution of

Biography

Andres Perez is a student of Master of Science of Engineering in Biochemical Engineering at Pontificia Universidad Católica de Valparaíso, Chile. His profession is a Biotechnologist Engineer of Concepcion University of Chile.

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