Precise regulating strategy based on multi-parameter fusion analysis applied to strengthen the coenzyme Q 10 biosynthesis of Rhodobater sphaeroides

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Abstract

Multi-parameters of physiological metabolism, environmental state, cell morphology, and manipulated variable, have mutual influences and constraints on coenzyme Q $_{10}$ (CoQ $_{10}$) biosynthesis of *Rhodobater sphaeroides*. In this work, a multi-parameter fusional correlation-analysis were applied to illuminate and optimize the crucial metabolism on CoQ $_{10}$ biosynthesis. The quantitative response model for accurate living cells concentration, morphological deformation, specific oxygen consumption rate (Q $_{O2}$), and specific product biosynthesis rate were established, the results revealed that maintain the optimal electrical conductivity(Cond.) and Q $_{O2}$ at 9.0±0.5 mS/cm and 0.06-0.08±0.01×10 $^{-7}$mmol/cell/h, respectively, by adjusting the nutrient feeding and oxygen transfer rate, the cell's morphology and oxygen uptake rate were strengthened. CoQ $_{10}$ production in 50L bioreactors was successfully improved by 35% to 3384mg/L than that of control, which would be more powerful and effective for scale up in the large-scale production of CoQ $_{10}$.

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