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A Process for Production of Trehalose by Recombinant Trehalose Synthase and Its Purification

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Highlights

- Industrial-scale production of trehalose by means of a recombinant TreS in *E. coli* is proposed.
- A set of batch fermentation strategies to improve the enzymatic activity is built. And the cell lysate containing TreS was directly used to convert maltose into trehalose.
- The isolation and purification of trehalose by continuous chromatographic separation represent a new technological breakthrough

Abstract

The process for production of trehalose using trehalose synthase (TreS) to convert maltose into trehalose in one step is highly desirable in the industry. Nonetheless, the studies on industrial-scale production of trehalose by recombinant TreS in *Escherichia coli* are still scarce. In this study, a TreS from *Pseudomonas putida* ATCC47054 was expressed in *E. coli* BL21(DE3) via plasmids pET15b and pET22b. pET15b-*treS* showed better plasmid stability and TreS expression, which revealed that the highest activity, 39866 ± 1420 U/(g dry cell weight) at the final lactose concentration of 4 g/L for 7 h at 27 °C in a 5-L fermentor at pH 8.0. The use of 30% (w/v) high-maltose syrup as a substrate can extend the temperature tolerance of TreS to 60 °C. More than 64% of maltose can be converted into trehalose by adding 200 U of TreS per gram of maltose at 50 °C for 24 h. The total

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