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Immobilization of the highly active UDP-glucose pyrophosphorylase from thermocrispum agreste provides a highly efficient biocatalyst for the production of UDP-glucose

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Authors:	Andrzej B. Jarzębski, et al.
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Biocatalysis that produces economically interesting compounds can be carried out by using free enzymes or microbial cells. However, often the cell metabolism does not allow the overproduction or secretion of activated sugars and thus downstream processing of these sugars is complicated. Here enzyme immobilization comes into focus in order to stabilize the enzyme as well as to make the overall process economically feasible. Besides a robust immobilization method, a highly active and stable enzyme is needed to efficiently produce the product of choice. Herein, we report on the identification, gene expression, biochemical characterization as well as immobilization of the uridine-5′-diphosphate-glucose (UDP-glucose) pyrophosphorylase originating from the thermostable soil actinobacterium Thermocrispum agreste DSM 44070 (TaGalU). The enzyme immobilization was performed on organically modified mesostructured cellular foams (MCF) via epoxy and amino group to provide a stable and active biocatalyst. The soluble and highly active TaGalU revealed a Vmax of 1698 U mg–1 (uridine-5′-triphosphate, UTP) and a Km of 0.15 mM (UTP). The optimum reaction temperature was determined to be 50°C. TaGalU was stable at this temperature for up to 30 min with a maximum loss of activity of 65%. Interestingly, immobilized TaGalU was stable at 50°C for at least 120 min without a significant loss of activity, which makes this enzyme an interesting biocatalyst for the production of

UDP-glucose.

Metryczka

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