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Immobilization of *Aspergillus oryzae* β-galactosidase in an agarose matrix functionalized by four different methods and application to the synthesis of lactulose.

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Abstract

Aspergillus oryzae β-galactosidase was immobilized in monofunctional glyoxyl-agarose and heterofunctional supports (amino-glyoxyl, carboxy-glyoxyl and chelate-glyoxyl agarose), for obtaining highly active and stable catalysts for lactulose synthesis. Specific activities of the amino-glyoxyl agarose, carboxy-glyoxyl agarose and chelate-glyoxyl agarose derivatives were 3676, 430 and 454 IU/g biocatalyst with half-life values at 50°C of 247, 100 and 100 h respectively. Specific activities of 3490, 2559 and 1060 IU/g were obtained for fine, standard and macro agarose respectively. High immobilization yield (39.4%) and specific activity of 7700 IU/g was obtained with amino-glyoxyl-agarose as support. The highest yields of lactulose synthesis were obtained with monofunctional glyoxyl-agarose. Selectivity of lactulose synthesis was influenced by the support functionalization: glyoxyl-agarose and amino-glyoxyl-agarose derivatives retained the selectivity of the free enzyme, while selectivity with the carboxy-glyoxyl-agarose and chelate-glyoxyl-agarose derivatives was reduced, favoring the synthesis of transgalactosylated oligosaccharides over lactulose.

Keywords: agarose matrix, β-galactosidase, Aspergillus oryzae, immobilization, lactulose.