Chloroperoxidase Stabilization by Covalent Binding in Mesoporous Sol-gel Glass*

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Abstract

A unique mesoporous sol-gel glass possessing a highly ordered porous structure (with a pore size of about 100 Å in diameter) was used as a support material for enzyme immobilization. Prior work has shown stabilization of a hydrolase, α-chymotrypsin. Here an oxidase, chloroperoxidase (CPO), was bound onto the glass via a bifunctional ligand, trimethoxysilylpropanal. The glass-bound CPO exhibited greatly enhanced thermostability in aqueous solution. The half-life of the glass-bound CPO was over 10-fold higher than that of the native enzyme at 40ºC. At 50ºC, the native CPO is unstable but retained some activity when bound on the sol-gel. From these results, it appears that the glass-enzyme complex developed through the present work can be used as high performance biocatalysts for various chemical processing applications, particularly in harsh conditions.

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