Immobilization of $\alpha$-Amylase onto Cyclic Carbonate Bearing Hybrid Material

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Enzymes are biocatalysts, having some excellent properties such as high activity, selectivity and specificity that make them advantageous compared to chemical ones[1]. However, many of the enzymes are stable only under mild experimental and environmental conditions and their application procedure is unfortunately restricted due to their short half lives in vivo[2,3].

Enzyme immobilization is preferred to enhance enzyme stability, multiple and repetitive use and to remove enzyme from the reaction mixture easily[4-6]. Generally, the main demand of a support is to elicit high chemical and mechanical stability, a hydrophilic nature and also non-toxic behavior. Polymeric materials are suitable candidates due to their reactive functional groups, good mechanical properties, ease of preparation method and applicability to introduce bio-friendly components for improving biocompatibility[7,8].

The aim of this study was to prepare a new enzyme carrier having cyclic carbonate groups by using sol-gel technique. Therefore, 3-(methacyrloyloxy)propyltrimethoxysilane (MEMO) and prehydrolyzed tetraethyloxyisilicate (TEOS) were mixed with 4-(3-trimethoxysilyl))propoxy)methyl]1,3-dioxolan-2-one (CPS) and after condensation an inorganic matrix (CTM) bearing cyclic carbonate groups was obtained. The amine groups of $\alpha$-amylase can be bind to cyclic carbonate groups. To gain an organic-inorganic hybrid support for enzyme immobilization, UV curing process was achieved by mixing enzyme-bounded matrix with commercial acrylate resins. Enzyme activity of free and immobilized $\alpha$-amylase was examined at different pH (5.0-8.0) and temperature (30-800C). The storage stability and reusability of the covalently immobilized enzyme was studied and analyzed.

Kaynaklar: