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COMPLEX ENZYMATIC PREPARATIONS IMMOBILIZED ON ALUMINUM OXIDE IN BREAKDOWN REACTION OF CHITOSAN

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Abstract. Chitosan is capable to be breakdown during physical, chemical and enzymatic cleavage. Products of chitosan decomposition have biological activities and therefore have potential applications in various industries. Particularly, glucosamine has the beneficial pharmacological effects to relieve osteoarthritis symptoms and can also be as a promising candidate for the prevention and/or treatment of some other diseases due to its antioxidant and anti-inflammatory activities.[1]

In present study, our research group performed hydrolysis reaction of chitosan using the following soluble complex enzymatic preparations: Amylosubtilin, GlucoLux-F, Protosubtilin, CelloLux-A, CelloLux-F produced by Sibbiopharm Ltd, Russia. Amylosubtilin had demonstrated the highest catalytic activity. So, we carried out immobilization of Amylosubtilin on a powdered aluminum oxide in the gamma phase (γ-Al_2O_3) modified with the following silane binding agents such as trimethoxymethylsilane (TMOMS), 3-aminopropyltriethoxysilane (APTES), 3-(2,3-epoxy-propoxy) propyl-trimethoxysilane (EPPMS), 3-mercaptopropyl-trimethoxysilane (MPP-TMOS). Also, we immobilized this enzymatic preparation on γ-Al_2O_3 modified with APTES by covalent binding via glutaraldehyde. The catalytic activity of soluble and immobilized enzymatic preparations was measured in U (U or μmol/min), where 1 U releases 1 μmol of glucosamine from chitosan per minute at pH 5.0 and 50 °C measured using the Elson-Morgan method.[2]

The biocatalyst based on γ-Al_2O_3 showed the highest immobilization yield (60,6 %). However, biocatalyst based on γ-Al_2O_3, modified with APTES, had the highest catalytic activity which was higher than that for soluble Amylosubtilin, i.e. 0.0099378 U and 0.0037209 U, respectively.

Table 1. Catalytic activities and immobilization yields of Amylosubtilin immobilized on the samples of powdered aluminum oxide in the gamma phase modified with silane coupling agents

Biocatalyst's carrier	CA·10^4, U	Immobilization yield, (Y, %)
γ-Al_2O_3	93,177	60,6
γ-Al_2O_3-TMOMS	92,107	30,2
γ-Al_2O_3-APTES	99,378	43,4
γ-Al_2O_3-EPPMS	88,215	43,7
γ-Al_2O_3-MPP-TMOS	64,805	7,2
γ-Al_2O_3-APTES-glutaraldehyde	65,425	36,5

References

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