

володіння мовою. За допомогою вдало підібраних комп'ютерних ігор викладач може зацікавити студентів, запропонувати їм нові джерела вивчення лексики, урізноманітнити навчальний матеріал.

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IMMOBILIZED ENZYME

В даній роботі описані основні відомості про іммобілізовані ферменти, а також вказані основні типи їх формування. Також в статті подано переваги іммобілізованих ферментів над звичайними та сфери їх застосування.

Ключові слова: *іммобілізовані ферменти, адсорбція, технології іммобілізації ферментів.*

This paper describes basic information about immobilized enzymes, as well as the basic types of their formation. The article also presents the advantages of immobilized enzymes over conventional enzymes and their scope.

Keywords: *immobilized enzymes, adsorption, enzyme immobilization technologies.*

An immobilized enzyme is an enzyme attached to an inert, insoluble material – such as calcium alginate. This can provide increased resistance to changes in conditions such as pH or temperature. It also lets enzymes be held in place throughout the reaction, following which they are easily separated from the products and may be used again – a far more efficient process and so is widely used in industry for enzyme catalysed reactions.[1]

Adsorption-based enzyme immobilization was among the first enzyme immobilization methods. One of the first immobilized enzymes prepared by adsorption was reported by Nillson and Griffin in 1916, when it was shown that invertase physically adsorbed by charcoal was still catalytically active. The first industrially used immobilized enzyme was prepared by adsorption of amino acid acylase on DEAE-cellulose.

The intrinsic advantages of adsorptive enzyme- immobilization methods:

- reversibility, which enables not only the purification of proteins but also the reuse of the carriers;
- simplicity, which enables enzyme immobilization under mild conditions;
- possible high retention of activity because there is no chemical modification, in contrast with covalent enzyme immobilization.

In general, however, the immobilized enzymes prepared by adsorption tend to leak from the carriers, owing to the relatively weak interaction between the enzyme and the carrier, which can be destroyed by desorption forces such as high ionic strength, pH, etc. Occasionally the enzymes can be strongly adsorbed on suitable carriers or the adsorption is stable enough under the application conditions [2].

Problem of use immobilized enzymes is that there is no ideal or universal immobilization technique, and there is no ideal or universal carrier apparent that the method of attachment and the carrier must be chosen by the dictates of the application, the enzyme, and the use [3].

Exist combinations of two or more of the bonding techniques, they may be classified as five different approaches to immobilization. These immobilization techniques are as follows:

1. the crosslinking of enzyme to enzyme without the benefit of carrier;
2. crosslinking of enzymes within carriers or on the surface of carriers;
3. covalent attachment to carriers;
4. adsorption on or in carriers;
5. encapsulation or entrapment.

In fact, it is rather obvious that during the process of crosslinking within the carrier, some adsorption to the surface of the carrier occurs. During the covalent coupling to carriers, it is probable that some of the enzyme is adsorbed on the carrier surface and in addition, some crosslinking may occur between the enzyme molecules. To carry this further, it is possible that during adsorption immobilization, not only crosslinking between molecules may occur, but also some covalent bonds may be established at the surface of some carriers and between the enzyme molecules. Encapsulation and entrapment may involve not only physical and chemical adsorption, but also crosslinking and covalent attachment to the surfaces. When we describe a particular bonding technique during the course of our discussions, we merely imply that the proposed attachment is predominately of one type of bonding [3].

Widely used application of the immobilization approach together with enzymes has been the enzymatic reactions on immobilized substrates. This approach facilitates the analysis of enzyme activities and mimics the performance of enzymes on e.g. cell walls [4].

Immobilized enzymes find applications in a wide array of fields, including food and textile industries, medicine, biodiesel production and other industrial sectors. Treatment of several diseases and bioremediation programs to remove toxic pollutants from the environment has also been undertaken using this technique. The potential of multienzyme immobilized systems as a tool to catalyze multistep reactions are the present focus of the scientific community to ensure better industrial yields [5].

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ПОДОЛАННЯ ПСИХОЛОГІЧНИХ БАР’ЄРІВ ПІД ЧАС ВИВЧЕННЯ ІНОЗЕМНОЇ МОВИ

Щоб підготувати впевнених фахівців на сьогодні від викладачів вищих навчальних закладів вимагають підвищення якості вивчення та викладання мов. Але проблема в тому, що студенти отримуючи значний обсяг мовленнєвих знань, не завжди опановують іншомовне мовлення, не можуть вільно читати і розуміти усні та письмові повідомлення. Без опанування навички комунікативної компетенції як аудіювання і говоріння ускладнюється повноцінна майбутня професійна діяльність. Успішність навчання залежить не