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Journal of Biomolecular Research & Therapeutics

Editorial Note

Development Editor Note: Bioimmobilization

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An enzyme that is immobilized is an enzyme bound to an inert, insoluble substrate such as calcium alginate (produced by reacting a mixture of sodium alginate solution and enzyme solution with calcium chloride). This will allow you to be more resistant to changes in conditions including pH and temperature. It also allows enzymes to be kept in place during the reaction, after which they can be easily removed from the products and reused, making it a much more effective operation. Whole cell immobilization is an alternative to enzyme immobilization.

The main aim of bio immobilization is to move the bioactive receptor's molecular recognition and specificity to the bio transducer in a way that maximizes the sensitivity of the physicochemical transducer underneath it. A crucial step in the development of bio-optrodes is the immobilization of sensing biomolecules into the optical fiber. Not only should a good immobilization technique be quick, easy, and durable, but, more importantly, gentle, so that the immobilized biological molecule can maintain its biochemical activity. Furthermore, biological recognition elements are often co-immobilized with indicator dyes, so that both molecules can preferably be appropriate for the immobilization process. The identification compounds may be immobilized directly on the optical fiber surface in certain situations. Alternatively, the molecules are first immobilized on membranes, such as cellulose acetate or polycarbonate, which are later physically attached to the optical fiber. For immobilizing a biological sensing compound, there are three main methods: adsorption/electrostatic interaction, trapping, and covalent attachment.

Enzyme/protein immobilization on an acceptable carrier is a powerful technique for various applications in the fields of biotechnology, fermentation technology, food technology, biomedical engineering, and biosensor engineering. The problem of rapid loss of catalytic activity and the instability of enzymes/proteins during storage and operational periods could be overcome by this technology. An ideal carrier material employed for enzyme/protein immobilization should be stable, nontoxic, biocompatible, noncarcinogenic, and should not compromise the structure and biological activity of proteins/enzymes.

Physical adsorption, entrapment, or covalent binding on carrier material are various methods for enzyme/protein immobilization. The physical approach is simple, inexpensive, and allows the original structure of enzymes/proteins to be better preserved, but with limited loading and immobilization efficiency. Compared with other immobilization approaches, covalent immobilization methods are typically more complex and time-consuming, but are very effective as biomolecules and dyes are not likely to leach out. It should be remembered that the behavior of the biomolecule can be modified by covalent immobilization. The photoreaction included triplet-state excitation, hydrogen abstraction, and radical recombination, resulting in covalent immobilization of nucleic acids or proteins with sterically accessible C–H bonds. This biomolecule immobilization technique blends the advantages of photolithography with electrochemical addressing of polymer films, making it ideal for a wide range of biomolecules.

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Received: February 10, 2021; **Accepted:** February 17, 2021; **Published:** February 24, 2021

Citation: Bindu Madhavi (2021) Editorial Note for Journal of Biomolecular Research and Therapeutics. J Biol Res Ther, Vol:10 Iss:2