

BOOK REVIEWS

Topics in Enzyme and Fermentation Biotechnology 10

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This book presents the subjects of immobilized microbial and plant cells, Koji solid state fermentation processes, fermentation techniques for production of Xanthan gums, and covalent chromatography. It is well written and covers these unrelated topics in sufficient depth to make the book useful for researchers who have varying degrees of familiarity with these areas. A book such as this requires both an introductory overview and a usable index. Fortunately, both are provided, thus making this topical collection of chapters useful as a reference text when put together with the previous nine volumes. The Introduction is weak in that it gives little more than an outline of previous subjects and current topics. A clear description is needed on how the chapters in volume 10 were intended to fit together with the rest of the series to help the reader obtain a flavor of the overall effort.

The production and use of immobilized *living* microbial cells is a timely topic covered in a well researched manner (about 150 references) by E. Corcoran. Entrapment of cells in alginate, carrageenan, and polyacrylamide is discussed. Key approaches and pitfalls are also presented, although the author's intent appears to direct the reader to the appropriate journal paper. This reader found Corcoran's style appropriate.

The areas of immobilization of cells by autoflocculation and adsorption are mentioned, but only briefly. The remainder of the chapter presents applications of various types of living immobilized cells, including production of ethanol, methane, butanol, acetone, acetic acid, amino

acids, and antibiotics. Hydrogen and ammonia production as well as identification, and steroid transformations are also covered.

The next chapter, by M. J. C. Rhodes, presents immobilized plant cell cultures. The location of this chapter immediately following immobilized microbial cells, and its emphasis on biochemical and chemical aspects of plant cell culture and product release gives an interesting contrast to microbial cells. The discussion on manipulation of product release from plant cells is well done (note, however, that Fig. 33 and 34 are reversed). The section on the bioreactor system for use with immobilized cells is somewhat short, particularly for those readers who might be interested in engineering aspects of such bioreactors. Overall, this chapter is very good.

The following chapter moves to the topic of Koji solid state processes. Written by S. Y. Huang and colleagues, it gives an excellent synopsis of a type of fermentation which is carried out at low moisture, i.e., solid state fermentation (SSF). SSF with *Aspergillus oryzae* for Shao-hsing wines is compared to a process utilizing natural starters (i.e., Koji) for sorghum liquor brewing. Mushroom cultivation is also mentioned. The topical introduction to this chapter helps put SSF in the perspective of an important food processing tool. The technical aspects of this fermentation are clearly outlined. This includes a section on heat generation and temperature effects in a heaped Koji.

A. Vincent presents fermentation techniques in Xanthan gum production in a textbook format. This chapter may be found useful by instructors wishing to give an overview in this area. This was apparently the intent of this chapter. The section on mixing principles is nicely done although the following section on cooling is somewhat short.

A change of pace is provided by Brocklehurst and coauthors in their description of covalent chromatography. When this reader first started examining this chapter, the thought of affinity chromatography immediately came to mind. The authors of the chapter apparently anticipated this first response of readers. Thus, early in the chapter, they explain the differences between the affinity and covalent chromatography. Covalent chromatography usually involves reactions of thiol groups of the molecule to be purified (i.e., the target molecule) with a thiol group covalently attached to a solid phase (chromatography support). A disulphide bond is formed and the target molecule is chemically bound to the support. After washing out the rest of the sample, the target molecule is recovered by displacement with a low molecular weight thiol, which is oxidized while at the same time causing dissociation of the thiol bond, and releasing the product. This chapter provides a detailed discussion of various types of chemistry through which selective product recovery can be achieved. This chapter may also be of interest to those studying protein refolding and the chemistry of intramolecular disulphide bonds.

Topics in Enzyme and Fermentation Biotechnology should be a useful addition to a biotechnologist's bookshelf. The editor, A. Wiseman, has assembled authoritative contributors to a volume that covers several timely topics in a useful manner.

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Instrumental Methods for Rapid Microbiological Analysis

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Manual manipulation still characterizes many microbiological procedures, measurements and assays, often with the result that analysis is slow. For this reason, it has been increasingly recognized that microbiology is ripe for development and application of rapid instrumental methods. Thus, this seven chapter book will be welcomed by microbiologists, biochemical and biomedical engineers, biophysicists, and others interested in rapid detection and identification of microorganisms. Chapter one by Rossi and Warner reviews fluorescent methods, which are becoming increasingly important, and have the potential, when combined with biochemically, immunologically or genetically specific assays, to provide a general, sensitive method for both detecting and identifying microorganisms. Chapter two by Neufeld, Pace, and Hutchinson reviews the related bio- and chemi-luminescence methods, which appear to be generally less flexible and less sensitive (the flux of emitted photons is generally smaller and more difficult to increase) than fluorescence-based methods. Chapter three by Hadley, Waldman, and Fulwyler treats flow cytometry, which only rather recently has been applied to microbiology, and which clearly and impressively operates at the single cell level. In present usage, flow cytometry is able to use light scatter and/or fluorescence, especially stains and labels for structure and specific binding sites, and also can employ a variety of vital stains based on enzyme activity or transmembrane potentials. Chapter four by Hartman and Thomas describes Raman spectroscopy of viruses, which, because of sensitivity constraints, is used for research purposes rather than rapid detection and identification. Chapter five by Fox and Morgan discusses applications of GC, with and without pyrolysis, for structural determinations. They show, for example, that detection of compounds unique to certain microorganisms offers the possibility of detection in complex samples. Chapter six by Sinha nicely reviews relevant approaches to detection, and then

describes a technology that provides rapid analysis of individual aerosol particles which may contain microorganisms. Chapter seven by Hadley and Yajko treats electrical impedance methods for detection of microorganisms via their metabolic activity. Impedance methods are appealing because electrical signals are readily measured, almost all microorganisms are capable of altering their medium's impedance, and optically difficult media (including those with particulates) can be utilized. Together, these contributions provide a valuable review of basic instrumental approaches.

A future edition could, however, benefit from increased discussion of detection limits, noise, and so on and the corresponding number of microorganisms (or binding sites, metabolic products, and the like) which can be detected, or are needed in order to make measurements relating to identification. Furthermore, a comparative overview giving approximate ranges of speed, sensitivity (detection limits), nature of the sample, amount of sample preparation, and so on would be valuable for tying together the individual chapters. In addition, because of the tremendous interest in genetic probes for rapid microbial detection and identification, it would be valuable to discuss this relatively new technology in the context of instrumental developments. Finally, the decision (presumably the publishers) to omit titles in the references is shortsighted; giving complete references would have increased the value of the book as a reference with only a small fractional cost in length. Overall, the book is both timely and valuable, and should be purchased by anyone with an interest in microbiological instrumentation.

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