

This book reflects the collection of work done which has been apportioned into five major topics in order to advance the subject to a higher level of understanding. The first section is on the basic chemistry of Maillard reaction which vividly elucidates the possible chemical pathways leading to a complex mixture of products. An HPLC and GC method of determining Maillard reaction products and intermediates has been presented which could be very useful in detecting the early stage of the reaction and in evaluating chemical changes during food processing. The next set of discussions will appeal more to food technologists since it covers actual applications of Maillard reaction to food — its effect on sensory properties of food and the main variables that can affect the extent of browning reaction. One of the more important aspects of Maillard reaction i.e. its effect on nutrition and food nutritional value is discussed in the third section. Interesting studies which reveal some of the physiological advantages and antioxidative effects *in vivo* of Maillard reaction products are presented. Examples of these are recent evidences on their anticarcinogenic effect and inhibition of *in vivo* mutagenicity by Maillard reaction products and coffee. Whilst there are physiological desirable effects of Maillard reaction, the fourth section on toxicology describes some Maillard reaction products which are potent mutagens or carcinogens. Finally, the last section describes the glycosylation of important biological proteins such as human IgG, albumin, DNA, etc., with reducing sugars, particularly glucose. Association of this reaction to various biological processes and disorders such as arteriosclerosis, cataracts, mutations and finally ageing is presented.

The book is excellently presented. The text is aptly supported by figures and tables. A list of references follow each discussion as an aid to further reading. As an added treat, a short verse on the Maillard reaction is presented which summarizes the whole content of the book. The book is recommended as a reference material for scientists in the different disciplines.

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Physiology of Immobilized Cells. Edited by J. A. M. de Bont, J. Visser, B. Mattiasson and J. Tramper, Elsevier Science Publishers, Amsterdam, 1990. xiv + 716 pp. ISBN 0-444-42700-7. Price: US\$218.00/ Dfl.425.00.

The text of this exhaustive volume covers the many various illuminating articles presented in the International Symposium entitled 'Physiology of

Immobilized Cells' held in December 1989 in Wageningen University, The Netherlands. These papers deal with various essential aspects, problems and prospects of immobilized cells and biocatalysts with a view to primarily comparing the properties of microorganisms in the immobilized states with those of their states in the living bodies and nature. The whole text has been prepared with the papers arranged scrupulously under six different headings as: opening lectures, immobilized cells in nature and their physiology, artificially-immobilized cells and performance, the micro environment: physicochemical aspects, the environment: physiological aspects and novel approaches in the study of the physiology of immobilized cells. It may appear, however, that some articles grouped under different sections deal with almost similar characteristics such as physicochemical aspects and physiology. But it is well understood that every author/worker has his own way of planning work, particularly when involving the same field, and hence it is really a difficult task for editors to classify such works. In any case, the classification in the present case could not be better done, perhaps.

The opening lectures by J. Tramper and G. Hamer summarize the very fundamental, traditional and useful aspects of immobilized cells and microbes with special stress on their physicochemical and physiological problems encountered in biotechnological fields. The part on immobilized cells in nature and their physiology presents 10 papers covering the aspects of bacterial status in natural environments, ecodynamics encountered by bacteria and their growth, biofilms in anaerobic fixed reactors, comparison of physiology of 'naturally' and artificially-immobilized cells and performance, the micro environment: physicochemical aspects, the environment: physiological aspects and novel approaches in the study of the physiology of immobilized cells. It may appear, however, that some articles grouped under different sections deal with almost similar characteristics such as physicochemical aspects and physiology. But it is well understood that every author/worker has his own way of planning work, particularly when involving the same field, and hence it is really a difficult task for editors to classify such works. In any case, the classification in the present case could not be better done, perhaps.

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anaerobic fixed reactors, comparison of physiology of 'naturally' and artificially-immobilized cells, roles of hydrogen transfer to and nutrient limitation effects on bacteria and surface-associated factors. These papers pinpoint the real incidents of cells and microbes in nature and various ecological variants including the experimental details of different trials and observations.

The part on artificially-immobilized cells and performance explains in as many as 31 valuable articles the facts of reactions and kinetics, reactor designs, influences of solvents and supports, yields dependence on various physicochemical parameters, immobilization of different animal cells and comparison of performances of artificially-immobilized cells with those functioning in nature. There are articles which explain physiological behaviour of animal cells immobilized on organic and inorganic supports.

The papers dealing with physicochemical aspects of micro environments of immobilized cells depict comprehensive pictures of influences of surfaces, concentration gradients, matrices, mass transfer models and changes in microbial activity after immobilization of microorganisms. The next section of the collection encompasses almost the similar approaches towards discussing physiological characteristics of immobilized cells with respect to their environmental effects and explains their behaviour vis-à-vis those in the free conditions.

The last part of this volume discusses the sophisticated methods of analysis which can be and are being used in the study of biotechnology, including methods of *in vivo*-NMR, *in vivo*- p^{31} -NMR, mass spectrophotometry, micro-electrode techniques, micro-fluorimetry and semiconductor electrode amperometry.

It is expected that the various novel methods of measurements and the diverse aspects of physicochemical and physiological behaviours of immobilized cells discussed in this collection will extend the dimensions of present day cell and enzyme biotechnology to a considerable extent. Biotechnologists can obviously find this work useful as a reference source on various aspects of immobilized cells, though the collection has been narrowly coined as 'Physiology of Immobilized Cells', which, however, was the identity of the Symposium that fathered this volume.

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