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Patents and Literature

The objective of this section is to keep readers aware of significant inventions and trends in industrial research as well as to highlight those areas of research that may lead to new biotechnological opportunities. Four major areas of biochemistry will be covered corresponding to enzymes, cells, bioproducts, and nucleic acids. The patent section will briefly cover each area every issue of the journal. The literature section will focus on one area per issue.

Patents

This section will identify patents and published patent applications from the international patent literature. The title, name(s) of the inventor(s), the patent number, the date of filing, the assignee, and a short description of the invention will be given. Copies of US patents can be obtained for 50¢ each from the Commissioner of Patents and Trademarks, Washington, DC 20231.

Enzymes

Enzyme Electrode

K. Nakamura; S. Nankai; T. Iijima; M. Fukuda
US 4,224,125 (Sept. 26, 1978)
Matsushita Electric Industrial Co., Ltd.

An electrode composed of an oxidoreductase enzyme, an artificial redox compound as an electron mediator and an electron collector; the enzyme and redox compound are in an immobilized state in juxtaposition or in contact with the collector.

Method Using Glucoamylase Immobilized on Porous Alumina

M. Abdullah; F. C. Armbruster
US 4,226,937 (April 27, 1979)

A process for converting a starch hydrolyzate to a dextrose-containing syrup using glucoamylase sorbed on porous alumina.

Method for Immobilizing Enzymes

M. Yoshida; M. Kumakura; I. Kaitsu
US 4,226,938 (Sept. 21, 1978)
Japan Atomic Energy Research Institute

A method for immobilizing enzymes or enzyme-containing cells comprising an adsorption step followed by mixing the adsorbed complex with a polymerizable monomer. Polymerization is effected between —20 and —80° C and a porous gel lump is formed through which a substrate solution can pass.

β-Galactosidase and Production Thereof

T. Miwa; R. Kobayashi; K. Tahita
US 4,229,539 (Jan. 26, 1979)
Kumiai Chemical Industry Co. Ltd.

A method to isolate β-galactosidase from the culture medium of *Penicillium multicolor.*

Preparation of Water-Insoluble Enzyme Compositions

G. Weidenbach; D. Bouse
US 4,230,803 (May 31, 1978)

A process for preparing a water-insoluble covalently bonded enzyme composition that has maximal activity with the lowest possible amount of enzyme.

Immobilized Light-Emitting Systems

M. A. DeLuca-McElroy
US 4,234,681 (July 21, 1978)
The Reagents of the University of California

The invention of a nonreactive elongated glass rod that is attached to an insoluble porous material containing immobilized luciferase.

Novel Lactase

T. Iida; S. Ozaki, T. Kotaka
US 4,237,230 (March 8, 1978)
Daiwa Kasei Kabushiki Kaisha

A lactase was isolated that has a molecular weight of 3×10^5, an optimum pH value of 6.0, and an optimum temperature of 60° C.

Cells

Production of Bacterial Cell Aggregates

G. B. Borglum
UK Patent Application GB 2 033 396 A (March 23, 1979)
Miles Laboratories Inc.

The production of a bacterial cell aggregate having increased particle hardness by contacting cells with a crosslinking reaction product and a specific cationic polymer obtained by the polymerization of an epihalohydrin and an alkylene polyamine.

Microbial Insecticide

K. D. Spence; R. E. Andrews
US 4,223,007 (April 27, 1979)
Battelle Development Corporation

An insecticidal agent composed of an insect pathogen of a virus, fungus, or bacteria origin embedded in a coacervate microbead comprised of nucleic acid and protein. The microbead structure shields the pathogen from sunlight-induced inactivation.

Micro-Carrier Cell Culture

J. F. Monthony; N. D. Schwartz; D. F. Hollis; G. D. Polostri
US 4,237,218 (Feb. 9, 1979)
Bio-Rad Laboratories, Inc.

A method for growing attachment-dependent cells using insoluble cationic polymers composed of hydrophilic monomers, crosslinking monomers of di and poly vinyls, and cationic monomers.

Bioproducts

Enzymatic Synthesis of L-Carnitine

J. P. Vandecastelle; J. Lemal; R. Malmaison
US 4,221, 869 (July 17, 1978)
Institut Francais du Petrole

A process for producing L-carnitine that comprised reacting 3-dehydrocarnitine in aqueous medium simultaneously with carnitine dehydrogenase, a coenzyme, and a reducing agent for the coenzyme.

Production of α-Emulsins

D. L. Gutnick; E. Rosenberg
US 4,230,801 (Feb. 22, 1979)
Biotechnologie Aktiengesellschaft für Emulsan

A process for producing extracellular microbial lipopolysaccharides using *Acinetobacter Sp.*

Apparatuses for the Anaerobic Digestion of Natural Organic Wastes

D. L. Hawkes; R. Horton; D. A. Srafford
US 4,233,155 (Nov. 22, 1978).
Hamworthy Engineering Limited

An apparatus for waste anaerobic digestion where improved efficiency is effected by efficient mixing and by intimate contact between evolving gases and bacteria.

Polysaccharide Producing Process Using Protease and Azotobacter

R. C. Righelato; T. R. Jarman
US 4,234,688 (March 10, 1978)
Tate & Lyle Limited

A process for producing polysaccharide from *Azotobacter vinelandii* by incorporating in the culture broth a protease that regulates the solution viscosity of the polysaccharide product.

L-Lysine α-Oxidase

H. Kusabate; K. Kodama, Y. Midorihaua; A. Kuninaka; H. Misono; K. Soda
US 4,234,691 (Feb. 26, 1979)
Yamasa Shoyu Kabushika Kaisha

An L-amino acid oxidase that forms α-ketǫ-aminocaproic acid, ammonia, and hydrogen peroxide from L-lysine by oxidative deamination.

Process for Converting Whey Permeate to Oil-Containing Yeasts

N. J. Moon; E. G Hammond
US 4,235, 933 (May 2, 1978)
Iowa State University Research Foundation, Inc.

A fermentation process using a fat-producing strain of *Candida curvata* for the conversion of whey permeate solids into yeast cells containing 40% triglyceride by dry weight.

Digestible Polyamino Acids

M. J. Heller; J. R. Ridgway
US 4,235,942 (Feb. 22, 1979)
Standard Oil Company (Indiana)

A method of preparing a digestible poly-L-methionine from L-methionine-*N*-carboxy anhydride so as not to exceed a degree of polymerization of about 60.

Process for the Production of Polysaccharide

T. R. Jarman; J. R. W. Govan
US 4,235,966 (June 6, 1979)
Talres Development (N.A.) N. V.

A process for the production of a partially acetylated variable block copolymer of D-mannuronic and L-guluronic acid residues using a nonpathogenic nonmucoid strain of *Pseudomonas.*

Method of Producing L-Isoleucine Using *Brevibacterium Flavum*

N. I. Zhdanova; T. V. Leonova; L. F. Kozyreva
US 4,237,288 (June 22, 1978)

A method of producing L-isoleucine by direct fermentation in amounts of at least 17 g/L medium.

Nucleic Acids

Deoxyribonucleic Acid Synthesis Using Binding Protein

P. P. Hung; S. Lee
US 4,224,408 (Nov. 22, 1978)

A method to obtain a complete copy of complementary DNA from ribonucleic acid by reverse transcription using a nucleic acid binding protein obtained from transformed chick fibroblasts.

Peptide Complexes of DNA-Containing Organisms

G. R. Wilhelm
US 4,228,068 (April 18, 1978)
A method to isolate the peptide complexes of the ribonucleic acid fraction of cells.

Processing for Producing Biologically Functional Molecular Chimeras

S. N. Cohen; H. W. Boyer
US 4,237,224 (Jan. 4, 1979)
Board of Trustees of the Leland Stanford Jr. University
A method for replicating a biologically functional DNA that comprises the transformation of compatible unicellular organisms with DNA prepared in vitro that is capable of replication and transcription.

Purification of Nucleotide Sequences Suitable for Expression in Bacteria

H. M. Goodman; J. Shine; P. H. Seeburg
GB 1 568 047 (May 25, 1978)
Reagents of the University of California
A method of purifying a fragment of a specific deoxyribonucleotide sequence for recombination with a DNA transfer vector and its transfer to a microorganism.

Protein Synthesis by Genetic Manipulation

M. Ptashne; G. D. Laver; T. M. Roberts; K. C. Backman
UK Patent Application GB 2 039 916 A (Jan. 14, 1980)
President and Fellows of Harvard College
A process to produce specific proteins coded for by eukaryotic or prokaryotic DNA in bacteria. The proteins are produced in their natural, functional state without extraneous peptides.

Method for Preparation of Novel Recombinant DNA

E. Namano; T. Masuda; N. Saito; D. Fukushima
UK Patent Application GB 2 042 554 A (October 24, 1979)
Noda Institute for Scientific Research

A method for the preparation of novel recombinant DNA using temperate phage DNA and another DNA in a position of ligation such that the phage DNA loses its coat protein producing ability.

Literature Survey

The objective of the literature survey is to make a thorough, recent review of publications in one specific area. This issue's survey will be on enzymes. Future surveys will be on cells, bioproducts, and nucleic acids. The articles will be chosen for their impact on current biotechnology processes and for their potential to break new ground that may lead to new applications. The entries are listed in alphabetical order by the first author's name.

Enzymes

1. Covalent Linkage of Glucose Oxidase on Modified Glassy Carbon Electrodes, C. Bourdillon, J. P. Bourgeois, and D. Thomas, *J. Am. Chem. Soc.* **102,** 4231–4235 (1980).
2. Preparation and Characterization of Enzymes Immobilized by Graft Copolymerization to Different Polysaccharides, L. D'Anguiro, P. Cremonesi, G. Mazzola, B. Focher, and G. Vecchio, *Biotech. Bioeng.* **22,** 2241–2272 (1980).
3. Purification of Enzymes by Heparin–Sepharose Affinity Chromatography, A. A. Farooqui, *J. Chromatogr.* **184,** 335–345 (1980).
4. Effect of the Cascade Operation of Enzymes in Packed Bed Immobilized Enzyme Reactors, S. Furusaki, I. Matsuura, and T. Miyauchi, *J. Chem. Eng. Jpn.* **13,** 304–308 (1980).
5. Studies on the Combined Action of Amylases and Glucose Isomerase on Starch and Its Hydrolysates. Part II. Immobilization of Glucoamylase, Y. Ghaali, R. M. Attia, M. Roushdi, and M. Alaa-Din, *Starch* (Weinheim, Fed. Repub. Germ.) **32,** 303–308 (1980).
6. Hydrolysis of Lactose by a Thermostable Beta-Galactosidase Immobilized on DEAE-Cellulose, M. W. Griffiths and D. D. Muir, *J. Sci. Food Agric.* **31,** 397–404 (1980).
7. Enzyme Electrode Probes, G. G. Guilbault, *Enzyme Microb. Technol.* **2,** 265–272 (1980).
8. Immobilization of Several Multienzyme Systems on Porous Glass Beads, P. M. Heidepriem, H. H. Kohl, and M. E. Friedman, *J. Solid-Phase Biochem.* **5,** 5–9 (1980).
9. The Use of an Immobilized Glycerol Dehydrogenase Nylon-Tube Reactor in the Determination of Glycerol, W. Hinsch and P. V. Sundaram, *Clin. Chim. Acta.* **104,** 87–94 (1980).

10. Immobilization of Enzymes for Medical Uses on Plastic Surfaces by Radiation-Induced Polymerization at Low Temperatures; K. Isao, M. Kumakura, A. Minoru, Y. Masharu, A. Yamada, and Y. Sakurai, *J. Biomed. Mater. Res.* **14,** 199–210 (1980).

11. Rotating Ring-Disk Enzyme Electrode for Biocatalysis—Kinetic Studies and Characterization of the Immobilized Enzyme Layer, R. A. Kamin and G. S. Wilson, *Anal. Chem.* **52,** 1198–1205 (1980).

12. Plastein Synthesis by α-Chymotryspin Immobilized on Hydrophobic Agarose Gel, I. Karube, Y. Yugeta, and S. Suzuki, *J. Mol. Catal.* **9,** 445–451 (1980).

13. Direct Measurement of the Thickness of the Unstirred Diffusion Layer Outside Immobilized Biocatalysis, V. Kasche and G. Kuhlman, *Enzyme Microb. Technol.* **2,** 309–312 (1980).

14. Improvement of Yields and Rates Using Immobilized Enzymes During the Hydrolysis of Cellulose to Glucose, H. E. Klei, D. W. Sundstrom, R. W. Coughlin, K. Ziolkowski, and G. Biederman, Sol. Energy Res. Inst. (Annual Biomass Energy Syst. Conf. Proc., 3rd) pp. 265–274 (1979).

15. Thermodynamic Principles of the Stabilization of Immobilized Enzymes, L. V. Kozlov, *Bioorg. Khim.* **6,** 1243–1254 (1980).

16. Enzyme-Catalyzed Peptide Synthesis in Biphasic Aqueous–Organic Systems, P. Kuhl, A. Koennecke, G. Doering, H. Daeumer, and H. D. Jakubke, *Tetrahedron Lett.* **21,** 893–896 (1980).

17. Determination of Penicillin with an Enzyme Electrode, J. Kulys, V. Gureviciene, and V. Laurinavicius, *Antibiotika* (Moscow), **25,** 655–659 (1980).

18. The Kinetics of Immobilized Enzyme Systems, K. J., Laidler and P. S. Bunting, *Methods Enzymol.* **64,** 227–248 (1980).

19. Preparation and Properties of Immobilized Sequence Specific Endonucleases, Y. H. Lee, R. Blakesley, L. A. Smith, and J. G. Chirikjian, *Methods Enzymol.* **65,** 173–182 (1980).

20. Cofactor Regeneration in Immobilized Enzyme Systems: Chemical Grafting of Functional NAD^+ in the Active Site of Dehydrogenases, M. D. Legoy, L. V. Garde, J. M. LeMoullec, F. Ergan, and D. Thomas; *Biochimie* **62,** 341–345 (1980).

21. Deacylation of Benzylpenicillin by Immobilized Penicillin Acylase, M. D. Lilly, S. W. Carleysmith, and P. Dunhill, *Biochemie* **61,** 317–321 (1980).

22. Dextran Synthesis by Immobilized Dextran Sucrase, A. Lopez and P. Monsan, *Biochemie* **62,** 323–329 (1980).

23. Use of Differently Immobilized Nucleotides for Binding NAD^+-Dependent Dehydrogenases, C. R. Lowe, I. P. Trayer, and H. R. Trayer, *Methods Enzymol.* **66,** 192–208 (1980).

24. Enzyme Thermistor Analysis in Clinical Chemistry and Environment and Process Control; B. Mattiasson, B. Danielsson, and K. Mosbach, *Enzyme Eng.* **4,** 213–216 (1980).

25. Immobilization and Characterization of L-Asparaginase on Hollow Fibers, G. Mazzola and G. Vecchio, *Int. J. Artif. Organs* **3,** 120–123 (1980).

26. Immobilization of Enzymes on Chitin and Chitosan, R. A. A. Muzzarelli, *Enzyme Microb. Technol.* **3,** 177–184 (1980).

27. Enzyme Immobilization by Condensation Copolymerization into Crosslinked Polyacrylamide Gels, A. Pollak, H. Blumenfeld, M. Wax, R. L. Baughn, and G. M. Whitesides, *J. Amer. Chem. Soc.* **102,** 6324–6326 (1980).

28. Hydrolytic Cleavage of Whey Lactose by an Immobilized Enzyme in a Fixed-Bed Reactor, J. E. Prenosil, J. Peter, and J. R. Bourne; *VT, Verfahrenstech* **6,** 392–396 (1980).

29. Immobilized Enzyme Catalysis Reviews, 1978; G. P. Royer; *Catal. Rev. Sci. Eng.* **22,** 29–73 (1980).
30. Coenzyme Activity of NAD^+ Bound to Polymer Supports Through the Adenine Moiety, H. L. Schmidt and B. Dolabdjian, *Methods Enzymol.***66,** 176–191 (1980).
31. Immobilized Chymosin. 4. Preparation and Properties of Immobilized Chymosin Using Paraffin Wax, K. Shindo, H. Sakamoto and S. Arima, *Hokkaido Daigaku Nogakubu Hobun Kiyo* **12,** 46–49 (1980).
32. Studies on Immobilized Chymosin. 5. Experiments in Cheesemaking with Immobilized Chymosin, K. Shindo, K. Sakurada, R. Niki, and S. Arima, *Milchwissenschaft* **35,** 527–530 (1980).
33. The Oscillatory Nature of Enzymic Hydrolysis of Peptide Bonds, L. S. Slobodyanikova, V. K. Latov, E. A. Paskonova, S. V. Vitt, and V. M. Belikov, *J. Mol. Catal.* **9,** 435–444 (1980).
34. Immobilization of Malic Enzyme and Malate Dehydrogenase on Sepharose CL-4B and Chitosan, P. Spettoli, A. Bottacin, and A. Zamorani, *Technol. Aliment.* **3,** 31–34 (1980).
35. Kinetics of the Enzymatic Synthesis of Benzylpenicillin, V. K. Svedas, A. L. Margolin, I. L. Borisov, and I. V. Berezin, *Enzyme Microb. Technol.* **2,** 313–317 (1980).
36. Immobilized Enzymes in Controlling and Monitoring of Discharges, A. Svenson, *Publ. Nordforsk, Miljoevardssekr,* **79,** 141–145 (1979).
37. Application of Enzymic Processes for Monitoring Refluents. Measurement of Primary Amines Using Immobilized Monoamine Oxidase and the Enzyme Thermistor, A. Svenson, P. A. Hynning, and B. Mattiasson, *J. Appl. Biochem.* **1,** 318–324 (1980).
38. Sulphydryl Oxidase: Properties and Applications, H. E. Swaisgood, *Enzyme Microb. Technol.* **2,** 265–272 (1980).
39. Application of Immobilized Lysine Decarboxylase Tubes for Automated Analysis of L-Lysine; A. Tanaka, N. Hagi, N. Itoh, and S. Fukui, *J. Ferment. Technol.* **58,** 391–394 (1980).
40. Modification of Enzymes with Water Soluble Polymers, I. M. Tereshin and B. V. Moskvichev, *Enzyme Eng.* **5,** 295–311 (1980).
41. Stereospecific Hydrogenations with Immobilized Microbial Cells or Enzymes, W. Tischer, W. Tiemeyer, and H. Simon, *Biochimie* **62,** 331–339 (1980).