

1. Record Nr.	UNINA9910830851103321
Titolo	Industrial biotechnology [[electronic resource] ] : sustainable growth and economic success // edited by Wim Soetaert and Erick J. Vandamme
Pubbl/distr/stampa	Weinheim, : Wiley-VCH, 2010
ISBN	1-282-68661-5 9786612686610 3-527-63023-6 3-527-63024-4
Descrizione fisica	1 online resource (523 p.)
Classificazione	CIT 900f WF 9700 VN 8900
Altri autori (Persone)	SoetaertWim VandammeErick J. <1943->
Disciplina	660.13 660.6
Soggetti	Biotechnology Biotechnology - Social aspects
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Industrial Biotechnology: Sustainable Growth and Economic Success; Contents; Preface; List of Contributors; The Scope and Impact of Industrial Biotechnology; 1: History of Industrial Biotechnology; 1.1 Early History; 1.2 The Penicillin Story; 1.3 The Coming of the Cephalosporins; 1.4 The Waksman Era; 1.5 Strain Improvement; 1.6 Semi-Synthetic Antibiotics to Combat Resistant Microbes; 1.7 The Primary Metabolites; 1.7.1 Amino Acids; 1.7.2 Nucleotides; 1.7.3 Vitamins; 1.7.4 Organic Acids; 1.7.5 Alcohols; 1.7.6 Polymers 1.7.7 Specialty Sugars, Sugar Alcohols,L-Sugars, Oligosugars, Novel Extracellular Polysaccharides, Biopigments, Cosmetics Including Fragrants, and Microbial Enzymes for Chiral Synthesis and Other Applications1.8 The Shift from Antibiotics to Pharmacological Agents; 1.8.1 Enzyme Inhibitors; 1.8.2 Immunosuppressants; 1.8.3 Antitumor Agents; 1.8.4 Ergot Alkaloids; 1.8.5 Agricultural Compounds; 1.9 The

Biopharmaceutical Revolution; 1.9.1 Human Insulin (Novolin, Humulin); 1.9.2 Erythropoietin (Epogen, Procrit); 1.9.3 Interferons; 1.9.4 Human Growth Hormone (Somatotropin, Somatropin Humatrope, Nutropin, Protropin, Somatren, Serostim)1.9.5 Tissue Plasminogen Activator (Activase, Alteplase); 1.9.6 Interleukins; 1.9.7 Factor VIII; 1.9.8 Colony-Stimulating Factors; 1.9.9 Human DNase (Pulmozyme); 1.9.10 Glucocerebrosidas (Cerezyme); 1.9.11 Monoclonal Antibodies; 1.9.12 Additional Biopharmaceuticals; 1.10 Recombinant Hosts; 1.10.1 E. coli; 1.10.2 Yeasts; 1.10.3 Molds; 1.10.4 Insect Cells; 1.10.5 Mammalian Cells; 1.10.6 Transgenic Animals; 1.10.7 Transgenic Plants; 1.11 Enzymes; 1.12 Bioconversions; 1.13 Vaccines; 1.14 Systems Microbiology; References

2: Industrial Systems Biology2.1 Introduction; 2.2 Industrial Biotechnology; 2.3 Market Drivers for Industrial Biotechnology; 2.4 Industrial Systems Biology; 2.5 Metabolic Models; 2.5.1 Microbial Metabolism-A Historical Perspective; 2.5.2 Genome Sequencing and Functional Genomics; 2.6 Reconstructed Metabolic Network Models; 2.6.1 Introduction; 2.6.2 Genome-Scale Reconstructed Network Process; 2.7 Industrial Systems Biology Case Studies; 2.7.1 A Mature and Developed Industrial Biotechnology Product: Bioethanol 2.7.2 A Recently Launched and Rapidly Growing Industrial Biotechnology Product: 1,3-Propanediol2.7.3 An In-Development Industrial Biotechnology Product: Succinic Acid; 2.8 Conclusion and Future Perspectives; References; 3: Fermentation Technology; 3.1 Introduction; 3.2 Types of Fermentations; 3.3 Fermentation Process; 3.3.1 Inoculum Generation; 3.3.2 Growth and Product Formation; 3.4 Fermentation Medium Design; 3.5 Sterilization of Air and Fermentation Medium; 3.6 Environmental Factors; 3.7 Fermentation Kinetics; 3.7.1 Batch Fermentation; 3.7.2 Continuous Culture; 3.8 Fermentation Equipment 3.8.1 Submerged Fermentation

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### Sommario/riassunto

Describing all topics of white biotechnology admitted to the 7th EU Frame Programme and new industrial production processes aiming towards the Kyoto objectives, this comprehensive overview covers the technology, applications, economic potential and implications for society. Directed at readers with a general interest in a specific technology, this is equally suitable as an introductory handbook to a wide range of industries, including chemicals, biotechnology and pharmaceuticals, food and feed, paper and pulp, personal care, energy and agriculture.

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