

Contents

1	General Introduction	1
	References	8
2	General Results	11
2.1	Definition of a Polyphasic Dispersed System (PDS)	11
2.2	Characteristic Volume and Pseudohomogeneity	14
2.3	Reaction Concentration and Pseudohomogeneity	20
2.3.1	Consequences of the Definition of Pseudohomogeneity	21
2.3.2	Phase Density	22
2.3.3	Phase Volume Relationship	23
2.3.4	Relationship Between R- and E-Concentrations	23
2.4	Mass Balances	24
2.4.1	Note Concerning the Variational Term Appearing in (2.4.12)	30
2.5	The Grouping Principle	31
2.6	Comment on a Certain Relativity in Writing the Mass Balance	32
2.6.1	Discussion	34
2.6.2	Example	35
2.7	Influence of Phase Density on Concentrations Calculation	37
2.7.1	Two-Phase System	39
2.7.2	Numerical Example	40
2.7.3	Critical Biomass	41
2.7.4	The Case of a Gaseous Phase	42
2.8	The Variation of the Internal Composition of a Microorganism with the Growth Rate Is a Consequence of the Mass Conservation Law	42
	References	45

3	Continuous Culture: The Chemostat	47
3.1	General Remarks	47
3.1.1	Historical Overview	48
3.1.2	The New Paradigm	49
3.2	The Chemostat and Monod's Model	50
3.2.1	The Beginnings	50
3.2.2	Summary Presentation of the Chemostat	51
3.2.3	Monod's Model	53
3.2.4	Stability of Steady States	55
3.3	The Chemostat in PDS Theory	60
3.3.1	The General Mass Balance	60
3.3.2	The Biphasic Chemostat	62
3.3.3	Steady States in Simple Situations	64
3.3.4	Partial, Specific Rates	64
3.3.5	The Water Problem	72
3.3.6	Examples	73
3.4	The Concept of Maintenance	78
3.4.1	Introduction	79
3.4.2	Method	81
3.4.3	Results	82
3.4.4	Substrate Recycling	84
3.4.5	Practical Considerations	87
3.4.6	Discussion	89
3.4.7	Additional Considerations	91
3.4.8	Should the Concept of Maintenance Be Abandoned?	93
3.5	Threshold Phenomena, Signals in Cells, and Metabolic Pathway Switches	94
3.5.1	Notice	94
3.5.2	Summary	95
3.5.3	Model with One Pathway $n = 1$	95
3.5.4	Model with Two Pathways $n = 2$	96
3.5.5	Introduction	97
3.5.6	Implicit Mass Balance	98
3.5.7	Explanation of Specific Rate	101
3.5.8	Discussion	120
3.5.9	Remarks on the Coupling of Maintenance Energy and the Metabolic Switch	123
3.6	The Crabtree Effect in <i>Saccharomyces cerevisiae</i>	124
3.6.1	Introduction	124
3.6.2	Result	131
3.6.3	Discussion	153
3.7	Respiro-Fermentative Phenomena in Bacterial Flocs	156
3.7.1	Introduction	156
3.7.2	Materials and Methods	157

3.7.3	Results	158
3.7.4	Modeling	163
3.7.5	Estimation of Substrate in the Medium	166
3.7.6	Discussion	168
	References	170
4	General Discussion.	175
4.1	About the Theory	175
4.2	On the Subject of the Applications.	178
	References	184
	Appendix A.1: Theory.	187
	Appendix A.2: Definitions	191
	Appendix A.3: Specific Growth Rate for the Whole	197
	Appendix A.4: Cancelling of Interphasic Exchange Fluxes at the System Level	201
	Appendix A.5: Consideration about the Micellian Variational Term . . .	203

Introduction to Polyphasic Dispersed Systems Theory
Application to Open Systems of Microorganisms' Culture
Thierie, J.

2016, IX, 205 p. 53 illus., 2 illus. in color., Softcover

ISBN: 978-3-319-27852-0