CONTENTS

	Preface	7
1	**Introduction in enzyme engineering** (Zemek, J.)	9
	References	12
2	**Materials for enzyme engineering** (Gemeiner, P.)	13
2.1	Natural carriers for immobilized biosystems (Gemeiner, P.)	13
2.1.1	Introduction	13
2.1.2	Polysaccharides as matrices for immobilization	15
2.2	Water-insoluble solid and solidified matrices in selection of enzyme producing strains (Zemek, J.)	73
2.2.1	The cross-linking reaction	75
2.2.2	Analytical methods	76
2.2.3	Physical testing	76
2.2.4	Functional testing	77
2.2.5	Characteristics of biopolymeric hydrogels for biotechnological applications prepared by cross-linking reactions	78
2.2.6	Hydrogels in microbiological practice	84
2.3	Standardization and unification in the determination of biotechnologically important enzymes activities using chromolytic substrates (Zemek, J.)	86
2.3.1	Preparation of chromolytic substrates	88
2.3.2	Properties of chromolytic substrates	92
2.3.3	The kinetics of reactions with insoluble chromolytic substrates	94
2.3.4	Application of chromolytic tablet tests	98
2.4	Modification of polymeric support through introduction of spacers (Zemek, J.)	101
	References	108
3	**Affinity chromatography** (Rexová-Benková, Ľ.)	120
3.1	Introduction	120
3.2	Theoretical principles of affinity chromatography	122
3.3	Bioaffinity chromatography	126
3.3.1	Preconditions for effective bioaffinity chromatography	136
3.3.2	Biospecific adsorbents	138
3.3.3	Character of the ligand and its binding	144

3.3.4 Cross-linked polysaccharides-bioaffinity adsorbents of glycanohydrolases 147
3.4 Other types of affinity chromatography 148
3.4.1 Affinity chromatography on synthetic ligands 148
3.4.2 Chromatography based on subunit affinity 152
3.4.3 Ultrafiltration affinity chromatography 152
References 152

4 Immobilized enzymes, organelles and cells. 158

4.1 Immobilized enzymes (Gemeiner, P.) 158
4.2 Methods of enzyme immobilization (Gemeiner, P.) 159
4.2.1 Support-binding methods 159
4.2.2 Entrapping methods. 178
4.3 Properties of immobilized enzymes (Rexová-Benková, Ľ.) 179
4.4 Immobilized enzymes and fundamental biochemical studies (Gemeiner, P.). . . . 188
4.4.1 Study of the primary and higher-ordered structures 188
4.4.2 Modelling of enzyme sequences and metabolic pathways. 192
4.5 Immobilized cells (Zemek, J., Vojtíšek, V.) 198
4.5.1 Biological aspects of preparation of immobilized biocatalysts. 198
4.5.2 Chemical and physico-chemical aspects of preparation of immobilized biocatalysts 202
4.6 Immobilized subcellular systems (Zemek, J.) 211
References 211

5 Immobilized biocatalysts in industry and other fields of application 220

5.1 Bioreactors with immobilized enzymes and cells (Báleš, V.) 220
5.1.1 Enzyme kinetics 220
5.1.1.1 Reaction kinetics of free enzymes 221
5.1.1.2 Reaction kinetics of immobilized enzymes 223
5.1.1.3 Reaction kinetics of immobilized cells 228
5.1.2 Mass transfer. 231
5.1.2.1 External diffusion 231
5.1.2.2 Estimation of mass transfer coefficient. 234
5.1.2.3 Internal diffusion 236
5.1.2.4 Estimation of texture characteristics. 239
5.1.2.5 Combined diffusion 243
5.1.3 Heterogeneous biocatalytic reactors 243
5.1.3.1 Types of bioreactors. 243
5.1.3.2 Mathematical models of basic types of bioreactors 245
5.1.4 Operational stability of reactors with immobilized biocatalysts 261
5.1.5 Characteristics of the immobilized biocatalyst bed 262
5.2 Practical uses of immobilized biocatalysts (Zemek, J.) 263
5.3 The use of immobilized biocatalysts in organic synthesis and industry (Zemek, J.) 264
5.4 Immobilized biopreparations in analytical chemistry and clinical biochemistry (Zemek, J.). 267
5.5 Use of immobilized enzymes in medicine for theraupetic purposes (Zemek, J.) . . 274
5.6 Immobilized enzymes for external use (Zemek, J.). 279
References 281

Index 294