

CONTENTS

Chapter 1. General chemistry of silica	1
1.1 Introduction	1
1.2 Bulk structure of silica	4
1.3 Surface structure	6
1.4 Silica-water interactions	11
1.5 References	14
Chapter 2. Pore structure of silica	15
2.1 Pore structure parameters	15
2.2 Formation of pore structure	40
2.3 Controlled porosity silica packings	49
2.4 Stability of porous silica	52
2.5 References	53
Chapter 3. Surface chemistry of porous silica	57
3.1 The surface structure of silica	57
3.2 Chemical modification of the silica surface	83
3.3 Ion-exchange properties of silica	130
3.4 References	141
Chapter 4. Particle characteristics	147
4.1 Particle size, shape and distribution: definitions	147
4.2 Methods of particle size grading and size analysis	153
4.3 Formation of silica particles	162
4.4 Porous silica layers	163
4.5 Acknowledgements	166
4.6 References	166
Chapter 5. Silica columns-packing procedures and performance characteristics	169
5.1 Introduction	169
5.2 Particle packing	169
5.3 Packing procedures	175
5.4 Comparison of performances of silica columns	179
5.5 References	185

Chapter 6. Silica and its chemically bonded derivatives as adsorbents in liquid-solid chromatography	187
6.1 Introduction	187
6.2 Silica as a polar packing in LSC	187
6.3 Reversed-phase silica packings in LSC	206
6.4 Polar chemically bonded silica packings as selective adsorbents in LSC	217
6.5 Adsorbent standardization	222
6.6 References	233
Chapter 7. Silica as a support in liquid-liquid chromatography	237
7.1 General aspects	237
7.2 Role of the support in liquid-liquid chromatography	238
7.3 Preparation of columns in liquid-liquid chromatography	241
7.4 Effect of silica support properties on retention and column performance	243
7.5 References	247
Chapter 8. Chemically modified silica as packing in ion-exchange chromatography	249
8.1 Selectivity and kinetics of ion exchange	249
8.2 Ion exchangers based on chemically bonded silica	252
8.3 Selectivity and performance of silica-based ion exchangers	264
8.4 Acknowledgements	269
8.5 References	269
Chapter 9. Silica as packing in size-exclusion chromatography	271
9.1 Separation mechanism	271
9.2 Resolution in size-exclusion chromatography	274
9.3 Optimization of silica support properties with respect to resolution and speed	278
9.4 Size separation on porous silica	280
9.5 References	287