

CONTENTS

Chapter I. Principles of Ion Exchange

Section 1. Ion-Exchange Resins	3
A Processing Tool	3
What is Ion Exchange?	3
What is Physical Nature of Ion-Exchange Resins?	3
Nomenclature	4
Ion-Exchange Reactions	5
Summary of Chemical Reactions	5
Fundamental Features of Ion Exchange	5
Information Common to Most Ion-Exchange Problems	6
Section 2. Resin Types	6
Strong-Acid Resins (Dowex 50, 50W)	6
Strong-Base Resins (Dowex 1,2,11, 21K)	7
Weak-Base Resins (Dowex 4)	9
Weak-Acid Resins	10
Retardion Resins	10
Chelating Resins	10
Section 3. Resin Properties	10
Capacities	10
Equivalency of Exchange	11
Resin Selectivity	11
1) Type of Functional Groups	12
2) Valence and Nature of Exchanging Ions	12
3) Nature of Non-Exchanging Ions	13
4) Ionic Forms of Resin	13
5) Total Solution Ionic Strength	13
Particle Size	15
Crosslinkage	17
Section 4. Operating Methods	23
Batch Operation	23
Column Operation	23
Moving Bed Operation	25

Chapter II. Applications of Ion Exchange

Section 1. General Divisions	27
Section 2. Water Treating	27
Section 3. Chemical Processing	27
Conversion	28
Purification	28
Concentration	28
Chromatography	29
Ion Exclusion	30
Ion Retardation	30
Non-Ionic Separations	31
Acid Retardation	31
Analytical	32
Addition Reactions	32
Chelation	32
Drying	33
Section 4. Commodity Areas	33
Catalysis	33
Plant Nutrition	33

Chapter III. Test Procedures for Dowex Resins

Section 1. Introduction	35
Section 2. Total Capacity, Moisture Content	35
Section 3. Screen Analysis	40
Section 4. Sphericity	41
Section 5. Notes for Test Procedures	42

Chapter IV. Laboratory Guide

Section 1. General Introduction	45
Section 2. Storage and Handling	45
Section 3. Laboratory Equipment	49
Section 4. General Operating Procedure	55
Section 5. Resin Regeneration	57
Section 6. Applied Laboratory Procedure	60
Section 7. Operating Capacity Determination	63
Section 8. Separation Processes	67
Section 9. Laboratory Procedure Fundamentals	68
Appendix A. Glossary	72
Appendix B. Properties of Dowex: Summary Table	74
Appendix C. Additional References	77
Index	78