

CONTENTS

PREFACE	v
Chapter 1. WATER	
1. Types of Water	1
2. Impurities	2
(a) Turbidity and Colour	2
(b) Iron and Manganese	3
(c) Alkalinity	5
(d) Hardness of Water	5
3. Methods of Water Softening	6
(a) Lime-Soda Process	6
(b) Base or Cation Exchange	8
(c) Demineralisation	9
4. Water for Boilers	11
References	12
Chapter 2. SEQUESTERING AGENTS AND COORDINATION COMPOUNDS	
1. Introduction	13
2. Coordination and Chelate Compounds	13
3. Chelation	18
(a) Chelate Compounds	18
(b) Planar Chelates	19
(c) Octahedral Chelates	21
4. Stability of Chelates	23
(a) Size of Ring	23
(b) Number of Rings	24
(c) Acid Strength and Chelate Stability	25
(d) Resonance Effects	27
(e) Ionic Factors	27
5. Methods of Estimating Chelate Formation and Determining Stability Constants	28
(a) Absorption Spectra	28
(b) Conductometric Titrations	31
(c) pH Changes	31
(d) Evaluation of the Stability Constants	33
6. Sequestering Agents	37
(a) Polyphosphates	37
(b) E.D.T.A.	41
7. Effect of pH on Complex Formation	43
8. Uses of Chelating Agents	46
(a) Water Treatment	46
(b) Dyeing	48
References	49

Chapter 3. ION EXCHANGE

1. Introduction	51
2. Composition of Ion-Exchange Materials	51
(a) Mineral Ion-Exchangers	52
(b) Synthetic Ion-Exchangers	53
(i) Condensation polymers, 54—(ii) Addition polymers, 55	
3. Anion-Exchange Resins	57
(a) Condensation Products	57
(b) Addition Resins	58
4. Properties of Ion-Exchange Resins	60
5. Capacity	62
6. Experimental Methods	62
7. Calculation of pK Values	64
8. Swelling	66
9. Determination of Swelling Pressures	70
10. Osmotic Coefficients in the Resin	75
11. Ion-Exchange Equilibria	77
(a) Equilibria with an Electrolyte with a Common Ion	77
(b) Equilibria between Two Metal Ions	78
12. Factors which Affect Selectivity	80
(a) Valency of Ions	80
(b) Swelling Pressure and Solvation of Ions	80
(c) Specific Interactions	82
13. Calculation of Selectivity Coefficients	82
(i) Solvation, 83—(ii) Electrostatic interactions, 84	
References	86

Chapter 4. CHEMICAL COMPOSITION OF NATURAL FIBRES

1. Vegetable Fibres	88
(a) Cotton	88
(i) Cellulose, 88—(ii) Waxes, 89—(iii) Pectic substances, 89—(iv) Protein, 91—(v) Ash, 91—(vi) Organic acids, 91	
(b) Flax	91
(i) Lignin, 91—(ii) Hemicelluloses, 93—(iii) Pectic substances, 94—(iv) Colouring matters, 95	
2. Animal Fibres	95
(a) Wool	95
(i) Grease, 95—(ii) Suint, 96—(iii) Ash, 96	
References	97

Chapter 5. PREPARATION OF YARNS FOR WEAVING

1. Introduction	98
2. Composition of Sizes	100
3. Man-Made Fibres	102
References	103

Chapter 6. STARCH AND GUMS

1. Starch	104
(a) Paste Formation	105
(b) Chemical Constitution	106
(c) Chemical Structure of Amylose	108
(d) Amylopectin	111
2. Starch Derivatives	113
(a) Hydrolysed Starches	113
(b) Oxidised Starches	114
(c) Dextrinisation	114
(i) White dextrin, 114—(ii) Yellow dextrans, 115—(iii) British Gum, 115	
(d) Cold-Water Dispersible Starches	115
(e) Esters	115
(f) Ethers	116
3. Water-Soluble Gums.	116
(a) Gum Arabic	116
(b) Gum Tragacanth	118
(c) Locust Bean Gum	118
(d) Algin (or Derivatives of Alginic Acid)	118
References	120

Chapter 7. OILS, FATS AND WAXES

1. Introduction	122
2. Oils and Fats	122
3. Waxes	123
4. Characterisation of Fats and Waxes	123
(a) Chemical Tests	123
(i) Saponification and acid values, 123—(ii) Unsaturation, 123—(iii) "Unsaponifiable matter", 124—(iv) Glycerol, 124	
(b) Melting or Freezing Points	125
5. Fatty Acid Composition	127
6. Fatty Acids	128
(a) Isolation of Fatty Acids	128
(i) Distillation, 129—(ii) Solubility, 129—(iii) Chromato- graphy, 130	
(b) Nomenclature	131
(c) Isomerism	131
(d) Particular Acids	132
(i) Lauric acid, 132—(ii) Myristic acid, 132—(iii) Palmitic acid, 132—(iv) Stearic acid, 133—(v) Oleic acid, 133—(vi) Erucic acid, 134—(vii) Linoleic and linolenic acid, 134— (viii) Eleostearic acid, 135—(ix) Ricinoleic acid, 135	
7. Alcohols	135
(a) Glycerol	135
(b) Fatty Alcohols	136
(c) Sterols	139

8. Hydrocarbons	140
9. Cotton Wax	140
10. Wool Wax	141
(a) Composition	141
(b) Wool Wax Acids.	143
(c) Wool Wax Alcohols	146
(i) Aliphatic alcohols, 146—(ii) Sterols, 146	
11. Wax of Cocoon Silk	147
12. Flax Wax	148
References	148

Chapter 8. SINGEING AND DESIZING OF COTTON

1. Singeing.	150
2. Desizing	150
(a) Acid-steeping or "Grey Souring"	151
(b) Rot Steeping	153
(c) Enzyme Desizing	153
(d) Treatment with Hydrogen Peroxide, etc.	160
References	163

Chapter 9. SCOURING OF COTTON

1. Introduction	164
2. Scouring.	165
(a) Kier Boiling.	165
(b) Continuous Processing	168
3. The Scouring Process	168
(a) General.	168
(b) Alkali Consumption	169
(c) Changes Occurring in Alkaline Treatments	171
4. Souring	175
5. Location of Wax	175
6. Surface Active Agents	178
7. Other Additives.	180
8. Dewaxing with Solvents	180
g. Reactions with Cellulose	182
References	185

Chapter 10. BLEACHING OF COTTON WITH HYPOCHLORITES

1. Introduction	187
2. The Bleaching Process	189
3. Reaction with Cellulose	191
4. Alkali Sensitivity	193
5. Rate of Attack on the Cotton.	197
6. Identity of the Reactive Species	198
7. Accelerated Bleaching Using Hypochlorite	206
References	210

Chapter 11. BLEACHING OF COTTON WITH PEROXIDE

1. Introduction	211
2. Sodium Peroxide	211
3. Hydrogen Peroxide	211
4. Stability of Peroxide Solutions	213
5. The Bleaching Process	217
6. Continuous Processes	218
7. Decomposition of Hydrogen Peroxide and its Reaction with Cellulose	220
8. Decomposition of Peroxide in the Presence of Metals	228
References	232

Chapter 12. BLEACHING OF COTTON WITH SODIUM CHLORITE

1. Introduction	233
2. Sodium Chlorite	233
3. The Bleaching Processing	236
4. Reactions during Bleaching	237
5. Reactions with Cellulose	239
6. Reactions of Chlorine Dioxide	242
References	246

Chapter 13. SCOURING AND BLEACHING OF LINEN AND MAN-MADE FIBRES

1. Linen	247
2. Bleaching Processes	248
3. Losses in Weight during the Bleaching Sequence	250
4. Reactions with Sodium Chlorite	251
5. Scouring and Bleaching of Man-Made Fibres	253
(a) Regenerated Cellulose and Cellulose Acetate Rayons	253
(b) Nylon	254
(c) Acrylic and Polyester Fibres	255
6. Peracetic Acid	255
7. Reactions with Cellulose	258
References	261

Chapter 14. SCOURING OF WOOL

1. Introduction	262
2. Loose Wool Scouring	263
(a) Saint Scouring	264
(b) Emulsion Scouring	265
(c) Solvent Extraction	266
(d) Freezing	267
3. Yarn Scouring	267
4. Scouring of Fabrics	268
5. Subsidiary Cleansing Processes	270
(a) Carbonising	270
(b) Milling	272
References	275

Chapter 15. TREATMENT OF WOOL IN AQUEOUS LIQUORS

1. Introduction	276
2. Evaluation of Damage Suffered by Wool Fibres	276
(a) Modification of the Outer Surface	276
(b) Disulphide Bond Rupture	277
(c) Main Chain Breakage	277
3. Reactions of Wool in Aqueous Media	282
4. Reaction with more Concentrated Acids	286
5. The Action of Alkali	294
6. The Action of Steam	299
7. Quantitative Aspects of Lanthionine Formation	300
References	304

Chapter 16. THE BLEACHING OF WOOL

1. Introduction	307
2. Sulphur Dioxide and Sulphites	307
3. Hydrogen Peroxide	308
4. Reaction of Cystine and Wool with Oxidising Agents	310
5. Reaction of Wool with Sulphite Ions	319
References	321

Chapter 17. SCOURING AND BLEACHING OF SILK

1. Scouring	323
2. Bleaching	324
3. Reactions of Fibroin with Chemical Reagents	325
References	327

Chapter 18. MERCERISATION OF COTTON

1. Introduction	328
2. Yarn Mercerising with Tension	330
3. Cloth Mercerisation with Tension	331
4. Slack Mercerising	333
5. Penetration of Caustic Soda	334
6. Changes in Fibre and Yarn Properties	335
7. Changes in Fabric Properties	339
8. Wetting Agents	342
9. Microscopic Changes in Cotton Fibres on Swelling	342
10. Modification of the Cellulose Structure	345
11. Absorption and Adsorption	350
(a) Moisture Absorption	350
(b) Adsorption of Dyes	352
(c) Adsorption of Caustic Soda and Barium Hydroxide	352
12. Reactivity of Mercerised Cellulose	353
13. Attack by Oxygen	354
14. Lustre	355

15. Swelling	355
(a) The Swelling of Cellulose with Alkali	355
(b) Swelling of Cotton Hairs	361
(c) Effect of Temperature	361
(d) Transient Swelling	362
16. Mercerisation of "Mixture" Fabrics	362
References	364
SUBJECT INDEX	367