

Contents

Preface to the First Edition	vii
Preface to the Second Edition	ix
Preface to the Third Edition	xi
1. Morphological and Macromolecular Structure.	1
General Structure and Hair Growth	2
Functions of Hair	7
Hair Growth	7
Hair Loss	11
A Mechanism for Hair Growth/Loss and Changes in Hair Size .	15
Surgical Treatment of Hair Loss	22
The Cuticle	23
The Cortex	30
Intercellular Matter	44
Medulla	45
Abnormalities	45
References	51
2. Chemical Composition	55
Composition of the Proteins of Human Hair and the Different	
Morphological Regions	59
Cosmetically Altered Hair	64
Chemical Composition of the Different Morphological	
Components	68

Fractionation and Peptide Analysis of Hair	72
Water: A Fundamental Component of Human Hair	77
Composition of Human Hair Lipid.	79
Trace Elements in Human Hair	84
References	87
3. Reducing Human Hair	93
Reduction of the Disulfide Bond	94
Reduction with Reagents Other than Mercaptan or Sulfite	106
Reactions of the Mercaptan Group	110
Water-Setting Human Hair	115
Set and Supercontraction.	116
Swelling: During and After Waving.	119
Permanent Waving of Human Hair	120
Safety Considerations for Permanent Waves.	126
References	126
4. Bleaching Human Hair.	131
Hair-Bleaching Compositions.	131
Reactions of the Proteins of Human Hair with Bleaches	133
Oxidation of Hair Proteins by Sun and Ultraviolet Light	139
Chlorine Oxidation of Hair	141
Hair Pigment Structure and Chemical Oxidation	141
Photochemical Degradation of Melanins	149
Physical Properties of Bleached Hair.	150
Safety Considerations for Hair Bleaches	150
References	151
5. Interactions of Shampoo and Conditioning Ingredients with Human Hair	153
General Formulations for Shampoos and Conditioners	154
Cleaning Hair	166
Perceptions in Cleaning Hair and the Subjective Testing of Shampoos	179
Sorption or Binding of Ionic Ingredients to Hair	185
Theory: Equilibria and Kinetics of Ionic Surfactant and Dye Interactions with Keratin Fibers	190
Damage to Hair from Shampoos, Grooming, and Weathering. .	211
Dandruff and Scalp Flaking	226
Safety Considerations for Shampoos and Conditioners	228
References	228
6. Dyeing Human Hair	233
Oxidation Dyes or Permanent Hair Dyes.	234
Semipermanent Hair Dyes	250

Temporary Hair Dyes or Color Rinses	254
Other Dyes for Hair	256
Safety Considerations for Hair Dyes	259
References	261
7. Polymers and Polymer Chemistry in Hair Products.	263
The Binding of Preformed Polymers to Hair	264
Cationic Polymers and Their Interactions with Hair	269
Cationic Polymer–Surfactant Complexes	273
Other Polymers	275
Hair Fixatives	277
Some Hair Fixative Formulations	282
In Situ Polymerizations in Hair	288
Safety Considerations for Polymers	294
References	295
8. The Physical Properties and Cosmetic Behavior of Hair . . .	299
Elastic and Tensile Deformations	300
Bending and Fiber Stiffness	316
Torsion and Fiber Rigidity	320
Density of Hair	322
Dimensions and Swelling Behavior	323
Friction	335
Hair Assembly Properties	343
References	366
Appendix	371
Physicochemical Constants	371
Units of Linear Measure	372
Approximate Diameter or Width of a Few Keratin Fibers	372
Index	373