

Contents

Preface to the Second Edition	V
Preface to the First Edition	VII
1. Introduction	1
2. Primary Polymer Adhesion Issues with Inks, Coatings, and Adhesives	3
2.1 Cast and Blown Films	4
2.2 Metallized Films	5
2.3 Foams	7
2.4 Textiles, Filaments and Yarns, and Nonwovens	8
2.5 Injection Molded Parts	10
2.6 Thermoformed Parts	11
2.7 Blow Molded Parts	12
2.8 References	13
3. Basic Principles of Atmospheric Discharge Surface Modification Technologies	15
3.1 Corona (Air) Plasma Discharge	15
3.2 Ozonation	19
3.3 Flame Plasma Discharge	20
3.4 Chemical Plasma Discharge	21
3.5 References	26

4. Air Plasma (Corona) Treatment Technologies: Features and Application Benefits	27
4.1 Bare Roll: Features and Application Benefits	27
4.2 Covered Roll: Features and Application Benefits	29
4.2.1 Silicone-Covered Rolls	30
4.2.2 Hypalon [®] -Covered Rolls	31
4.2.3 Epoxy Covered Rolls	31
4.2.4 Ceramic Covered Rolls	31
4.2.5 Glass-Covered Rolls	33
4.2.6 Retrofitting Roll Coverings	33
4.3 Dual Dielectric: Features and Application Benefits	34
4.4 Blown Arc Systems: Features and Application Benefits	35
4.5 Blown Ion Systems: Features and Application Benefits	36
4.6 References	37
5. Ozone Treatment Technology: Features and Application Benefits	39
5.1 References	48
6. Flame Plasma Treatment Technologies: Features and Application Benefits	49
6.1 Burner Design	50
6.2 Flame Velocity	51
6.3 Optimization of Treatment	57
6.4 References	59
7. Chemical Plasma Treatment Technologies: Features and Application Benefits	61
7.1 Low Pressure Vacuum Chemical Plasmas	61
7.2 Vacuum Plasma Deposition Processes and Applications	62
7.3 Optimizing Vacuum Plasma Processing for Adhesion	66
7.4 Atmospheric Chemical Plasmas	69
7.5 Influence on Surface Cleaning Using Carbon Dioxide	77
7.6 Atmospheric Plasma Surface Modification: Polymeric Surfaces	89
7.7 Atmospheric Plasma Modification: Textile and Nonwoven Surfaces	100

7.8 Atmospheric Plasma Modification: Metal Surfaces	112
7.9 Atmospheric Plasma Modification: Paper	122
7.10 References	130
8 Applying Surface Modification Methods to Decorating Processes to Promote Adhesion	133
8.1 Printing Processes	134
8.1.1 Direct Transfer Plate Technologies	134
8.1.1.1 Flexography	136
8.1.1.2 Gravure	144
8.1.1.3 Screen Printing	146
8.1.1.4 Letterpress	151
8.1.1.5 Pad Printing	153
8.1.1.6 Digital Printing	157
8.1.2 Indirect Transfer Plate Technology	164
8.1.2.1 Lithography	164
8.2 Labeling	180
8.2.1 Paper Labels	180
8.2.2 Film Labels	181
8.2.3 In-Mold Labels	182
8.2.4 RFID Labels	183
8.3 Painting	185
8.4 Dyeing	189
8.5 References	195
9 Applying Surface Modification Methods to Promote Adhesion with Coating Processes	197
9.1 Coating Processes and Adhesion to Porous and Non-Porous Substrates	197
9.1.1 Adhesion of Gap Coatings	198
9.1.1.1 Adhesion of Air Knife Coatings	199
9.1.2 Adhesion of Immersion Coatings	200
9.1.3 Adhesion of Curtain Coatings	201
9.1.4 Adhesion of Rotary Screen Coatings	202
9.1.5 Adhesion of Reverse Roll Coatings	203
9.1.6 Adhesion of Gravure Coatings	204
9.1.7 Adhesion of Metering (Meyer) Rod Coatings	206
9.1.8 Adhesion of Slot Die (Extrusion) Coatings	207
9.1.9 Adhesion of Hot Melt Coatings	209
9.1.10 Adhesion of Flexographic Coatings	211

9.1.11 Adhesion of Silk Screen Coatings	212
9.1.12 Adhesion of Nanocoatings	214
9.2 References	216
10 Applying Surface Modification Methods to Promote Adhesion to Plastic Nanocomposite and Composite Materials	217
10.1 Adhesion of Inks to Polymer Nanocomposite-Based Electronic Packaging	223
10.2 Plasma Adhesion Promotion Techniques for Nanocomposite Photovoltaic Solar Cells	225
10.3 References	231
Index	233