

CONTENTS

Chapter 1 THE GROWTH OF A TECHNOLOGY

1.1 The Balance of Properties	1
1.2 The Invention of Toughened Polystyrene	2
1.3 New Materials and Expanding Markets	3
References	8

Chapter 2 COMPATIBILITY AND COPOLYMERISATION

2.1 Introduction	9
2.2 Compatibility	9
2.3 Copolymerisation	21

Chapter 3 CHARACTERISATION OF STRUCTURE

3.1 Optical Microcopy	39
3.2 Transmission Electron Microscopy	42
3.3 Scanning Electron Microscopy	48
3.4 Light Scattering	49
3.5 Coulter Counter	51
3.6 Gel Separation	52
3.7 The Secondary Glass Transition	56
3.8 Characterisation of Structure in Degraded Polymers	62
References	64

Chapter 4 MANUFACTURE OF TOUGHENED PLASTICS

4.1 Bulk and Bulk-Suspension Polymerisation of HIS	66
4.2 Manufacture of Toughened Epoxy Resins	82
4.3 Toughened Polypropylene	87
4.4 Emulsion Polymerisation–ABS Manufacture	90
4.5 Blending	99
4.6 Comparison of Processes	102
References	105

Chapter 5 VISCOELASTIC PROPERTIES

5.1 Experimental Observations	108
5.2 Models for Toughened Polymers	116
5.3 Mathematical Theories	118
5.4 Application of Theories	122

5.5	Stress Analysis	126
5.6	Orientation	134
	References	134
Chapter 6 DEFORMATION MECHANISMS IN GLASSY POLYMERS		
6.1	Shear Yielding	137
6.2	Crazing	155
6.3	Interactions between Crazes and Shear Bands	177
	References	180
Chapter 7 MECHANISMS OF RUBBER TOUGHENING		
7.1	Statement of the of Toughening	182
7.2	Qualitative Theories of Toughening	188
7.3	Volumetric Strain Measurements	195
7.4	Kinetics of Crazing	195
7.5	Structure-Property Relationships	206
	References	210
Chapter 8 DEFORMATION AND YIELDING		
8.1	Creep	212
8.2	Tensile Testing	226
8.3	Multiaxial Loading	231
	References	241
Chapter 9 FRACTURE MECHANICS		
9.1	Linear Elastic Fracture Mechanics	244
9.2	Crack-Opening Displacement Criterion	251
9.3	Test Methods	253
9.4	Factors Affecting Fracture Resistance	258
	References	270
Chapter 10 IMPACT STRENGTH		
10.1	Charpy and Izod Test	273
10.2	Falling Weight Test	286
10.3	Effect of Temperature on Impact Strength	290
10.4	Effect of polymer Structure on Impact Strength	297
10.5	Ageing	301
	References	304

Chapter 11 MELT RHEOLOGY AND PROCESSING

11.1	Elastico-Viscous Properties	306
11.2	Viscosity	310
11.3	Microrheology	316
11.4	Thermoforming	321
11.5	Extrusion	324
11.6	Injection Moulding	326
	References	331

Chapter 12 ELECTROPLATING

12.1	Outline of Electroplating Process	334
12.2	Peel Strength	338
12.3	Thermal Cycling	342
	References	343

	SI UNITS CONVERSION TABLE	345
--	---------------------------	-----

	AUTHOR INDEX	347
--	--------------	-----

	SUBJECT INDEX	355
--	---------------	-----