

HANSER

Alberto Naranjo C., Maria del Pilar Noriega E., Tim A. Osswald,
Alejandro Rojan, Juan Diego Sierra M.

Plastics Testing and Characterization

Industrial Applications

ISBN-10: 3-446-41315-4

ISBN-13: 978-3-446-41315-3

Table of Contents

For further information and order see
<http://www.hanser.de/978-3-446-41315-3>
or contact your bookseller.

TABLE OF CONTENTS

Preface	vii
1 Introduction	1
1.1 Testing Techniques	1
1.2 Steps for Successful Polymer Characterization	4
1.3 Preparation and Separation Techniques	4
References	6
2 Spectroscopy	7
2.1 FTIR Spectroscopy	8
2.1.1 FTIR Spectrophotometer	9
2.1.2 FTIR Techniques	11
2.1.3 Correlation of Polymer and Additives Structure and FTIR Spectra	14
2.1.4 Useful FTIR Standard Measuring Techniques	20
2.2 Raman Spectroscopy	45
2.3 Energy Dispersive X-Ray Spectroscopy	51
References	53
3 Gas Chromatography and Selective Mass Detection	55
3.1 Gas Chromatography Instrumentation	55

3.2 Correlation of Additive Structure and Mass Spectra	59
3.3 Selected Standards for Gas Chromatography Testing	62
References	73
4 Thermal Properties	75
4.1 Thermal Conductivity	75
4.2 Specific Heat and Specific Enthalpy	80
4.3 Density	84
4.4 Thermal Diffusivity	84
4.4.1 New Developments in Thermal Diffusivity Measurement	88
4.5 Linear Coefficient of Thermal Expansion	91
4.6 Curing Behavior	97
4.7 Thermal Analysis and Measuring Devices	100
4.7.1 Differential Scanning Calorimetry (DSC)	102
4.7.2 Thermogravimetry (TGA)	120
References	126
5 Melt Rheology	127
5.1 Basic Concepts and Terminology	128
5.2 Constitutive Models	142
5.2.1 Newtonian Model	143
5.2.2 Power Law Model	143
5.2.3 Bird-Carreau-Yasuda Model	144
5.2.4 Pressure Dependence of Viscosity	145
5.2.5 Phan-Thien and Tanner Multimode Model	146
5.3 Rheometry	147
5.3.1 The Melt Flow Indexer	147
5.3.2 Capillary Viscometer	150
5.3.3 Rotational Rheometry	157
5.3.4 Extensional or Elongational Rheometry	165
References	183
6 Mechanical Properties	185
6.1 Mechanical Properties	185
6.1.1 The Short-Term Tensile Test	185
6.1.2 Impact Strength	200
6.1.3 Creep Behavior	225
6.1.4 Dynamic Mechanical Tests	241
6.1.5 Fatigue Tests	246

6.1.6	Strength Stability Under Heat	253
	References	260
7	Permeability Properties	263
7.1	Sorption	264
7.2	Diffusion and Permeation	265
7.3	Measuring S , D , and P	275
7.4	Diffusion of Polymer Molecules and Self-Diffusion	281
	References	285
8	Environmental Effects and Aging	287
8.1	Water Absorption	287
8.2	Weathering	291
8.3	Chemical Degradation	301
8.4	Thermal Degradation of Polymers	308
	References	314
9	Electrical, Optical, and Acoustic Properties	315
9.1	Electrical Properties	315
9.1.1	Dielectric Behavior	315
9.1.2	Electric Conductivity	321
9.1.3	Application Problems	326
9.1.4	Magnetic Properties	338
9.2	Optical Properties	339
9.2.1	Index of Refraction	340
9.2.2	Photoelasticity and Birefringence	342
9.2.3	Transparency, Reflection, Absorption, and Transmittance	344
9.2.4	Gloss	349
9.2.5	Color	351
9.3	Acoustic Properties	353
9.3.1	Speed of Sound	354
9.3.2	Sound Reflection	354
9.3.3	Sound Absorption	355
	References	357
INDEX		359