CONTENTS

1.	PKE	SERVATION OF QUALITY THROUGH PACKAGING	1			
	1.1	Quality and shelf life of food	1			
	1.2	Physical and chemical interactions between plastics and food	4			
	1.3	Organization of the book	4			
		General Plastic/Packaging/Food References	8			
2.	CHA	ARACTERISTICS OF PLASTIC MATERIALS	9			
	2.1	Classification, manufacture and processing aids	9			
	2.2	Structure and states of aggregation in polymers	17			
	2.3	The most important plastics	21			
3.	ADI	DITIVES FOR PLASTICS AND THEIR TRANSFORMATION PRODUCTS	47			
	3.1	Additives for plastics	47			
	3.2	Transformation products of plastics stabilizers	65			
4.	PARTITION COEFFICIENTS					
	4.1	Thermodynamic fundamentals	79			
	4.2	Additive molecular properties	87			
	4.3	Estimation of partition coefficients	90			
	4.4	Expected orders of magnitudes for partition coefficients	118			
5.	MODELS FOR DIFFUSION IN POLYMERS					
	5.1	Diffusion in polymers – The classical approach	126			
	5.2	Diffusion in polymers – The computational approach	141			
	5.3	Conclusions	151			
6.	PREDICTION OF DIFFUSION COEFFICIENTS IN GASES, LIQUIDS, AMORPHOUS					
	SOL	IDS AND PLASTIC MATERIALS USING AN UNIFORM MODEL	159			
	6.1	Introduction	159			
	6.2	Interaction model	161			
	6.3	Prerequisites for diffusion coefficients	164			
	6.4	The diffusion coefficient	168			
7.	TRANSPORT EQUATIONS AND THEIR SOLUTIONS					
	7.1	The transport equations	183			
	7.2	Solutions of the diffusion equation	188			

8.	NUMERICAL SOLUTIONS OF THE DIFFUSION EQUATION					
	8.1	Why numerical solutions?	221			
	8.2	Finite-difference solution by the explicit method	221			
	8.3	Spatially variable diffusion coefficient	230			
	8.4	Boundary conditions	231			
	8.5	One-dimensional diffusion in cylindrical and spherical geometry	233			
	8.6	Multi-dimensional diffusion	235			
9.	PERMEATION OF GASES, WATER VAPOR AND VOLATILE ORGANIC					
	COM	MPOUNDS	239			
	9.1	Permeation of gases	240			
	9.2	Permeation of water vapor	260			
	9.3	Permeation of organic vapors	262			
10.	MIGRATION OF PLASTIC CONSTITUENTS					
	10.1	Principles of migration testing	287			
	10.2	Analysis of specific migrants	300			
	10.3	Safety assessment of modern food packaging applications	336			
11.	MIGRATION FROM FOOD PACKAGING: REGULATORY CONSIDERATIONS					
	FOR ESTIMATING EXPOSURE		359			
	11.1	Introduction	359			
	11.2	Estimating the exposure to components of food packaging	362			
	11.3	Establishing a threshold policy for regulating food contact materials	364			
	11.4	Evaluating migration from food packaging materials	366			
	11.5	Using migration modeling to estimate exposure to components of food packaging	374			
		Appendix 11-I	378			
		Appendix 11-II	380			
		Appendix 11-III	383			
12.	EUROPEAN COMMUNITY LEGISLATION ON MATERIALS AND ARTICLES					
	INTI	ENDED TO COME INTO CONTACT WITH FOOD	393			
	12.1	Introduction	393			
	12.2	Harmonization of national regulations	394			
	12.3	Directive on plastics materials	399			
	12.4	Directives on the system of checking migration	402			
	12.5	Other complementary Community initiatives	404			
	12.6	Directives concerning individual substances	405			
	12.7	Activities of other institutions connected with the Community Directives	406			
	12.8	Conclusions	406			

13.	SENSORY PROBLEMS CAUSED BY FOOD AND PACKAGING INTERACTIONS				
	13.1	Problems with off-odor compounds	407		
	13.2	Identification of off-odor compounds	409		
	13.3	Case studies	411		
14.	CASE STUDY: STYRENE MONOMER MIGRATION INTO DAIRY PRODUCTS				
	IN S	INGLE SERVE PORTION PACKS	427		
	14.1	Introduction	427		
	14.2	Case study: styrene taint in coffee creamers and condensed milk packed in portion			
		packs	431		
	14.3	Estimation of styrene migration from PS	432		
	14.4	Estimation of styrene transfer from portion pack into food	439		
15.	POS	SIBILITIES AND LIMITATIONS OF MIGRATION MODELING	445		
	15.1	Migration modeling for polyolefins	446		
	15.2	Migration modeling for non-polyolefins	455		
	15.3	Optimization of modeling	457		
	15.4	Migration modeling with new polymer-migrant systems	462		
	15.5	Modeling of migration from multilayer structures	466		
API	PENDI	XES			
	Appe	ndix I			
		Table 1 : Diffusion data for low molecular weight organic substances in			
		Polyethylenes (PE). Low Density Polyethylene (LDPE) and Linear Low			
		Density Polyethylene (LLDPE)	470		
		Table 2 : Diffusion data for low molecular weight organic substances in Polyethylene	S		
		(PE). Medium and High Density Polyethylenes (MDPE & HDPE)	498		
		Table 3 : Diffusion data for low molecular weight organic substances in various types			
		of Polypropylenes (PP)	511		
	Appendix II				
		Table 1 : UNIFAC group volume $(R_{\boldsymbol{k}})$ and surface area $(Q_{\boldsymbol{k}})$ parameters	531		
		Table 2 : UNIFAC group interaction parameters for prediction of vapour-liquid			
		equilibria at temperatures between 250 and 425 K	539		
	Appendix III				
		Table 1 : Trivalent phosphorus antioxidants	565		
		Table 2 : Major commercial hindered amine stabilizers	566		
		Table 3: Major commercial hindered phenolic antioxidants	567		
IND	EX		569		