

Physical Properties of Foods

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TO OUR PARENTS

SEMİHA-ŞEVKET SAHİN

&

EMİNE-ERDOĞAN SUMNU

Who have given us our roots

Preface

We have been teaching an undergraduate course of Physical Properties of Foods in Department of Food Engineering in Middle East Technical University for four years. We have had difficulty in finding a suitable textbook for undergraduate students since standard physical properties of foods books do not cover all the physical properties such as size, shape, volume and related physical attributes, rheological properties, thermal properties, electromagnetic properties, water activity and sorption properties, and surface properties together. In addition, engineering concepts and physical chemistry knowledge are not combined in these books.

We tried to write a book to provide a fundamental understanding of physical properties of foods. In this book, the knowledge of physical properties is combined with food science, physical chemistry, physics and engineering knowledge. Physical properties data are required during harvesting, processing, storage and even shipping to the consumer. The material in the book will be helpful for the students to understand the relationship between physical and functional properties of raw, semi-finished and processed food to obtain products with desired shelf-life and quality.

This book discusses basic definitions and principles of physical properties, the importance of physical properties in food industry and measurement methods. Moreover, recent studies in the area of physical properties are summarized. In addition, each chapter is provided with examples and problems. These problems will be helpful for students for their self-study and to gain information how to analyze experimental data to generate practical information.

This book is written to be a textbook for undergraduate students which will fill the gap in physical properties area. In addition, the material in the book may be of interest to people who are working in the field of Food Science, Food Technology, Biological Systems Engineering, Food Process Engineering and Agricultural Engineering. It will also be helpful for graduate students who deal with physical properties in their research.

The physical properties of food materials are discussed in 6 main categories such as size, shape, volume and related physical attributes, rheological properties, thermal properties, electromagnetic properties, water activity and sorption properties and surface properties in this book. In the first chapter physical attributes of foods which are size, shape, volume, density and porosity are discussed. Methods to measure these properties are explained in details. In Chapter 2, after making an introduction on Newtonian and non-Newtonian fluid flow, viscosity measurement methods are discussed. Then, principle of viscoelastic fluids, methods to determine the viscoelastic behavior and models used in viscoelastic fluids are mentioned. Chapter 3 explains definition and measurement methods of thermal properties such as thermal conductivity, specific heat, thermal diffusivity and enthalpy. In the

fourth chapter color and dielectric properties of foods are covered. In Chapter 5, equilibrium criteria and colligative properties are discussed. Then, information is given on measurement of water activity. Finally preparation of sorption isotherms and models are discussed. The last chapter is about surface properties and their measurement methods. Where appropriate, we have cited throughout the text the articles that are available for more information.

We are deeply grateful to Prof. Dr. Haluk Hamamci for encouraging us during writing this book and his belief in us. We would also like to thank our colleagues Prof. Dr. Ali Esin, Prof. Dr. Haluk Hamamci, Assoc. Prof. Dr. Nihal Aydogan, Assoc. Prof. Dr. Pinar Calik, Assoc. Prof. Dr. Naime Asli Sezgi, Assoc. Prof. Dr. Esra Yener, Assist. Prof. Dr. Yusuf Uludag, who read the chapters and gave useful suggestions. We would also like to thank our Ph.D student Halil Mecit Oztop and his brother Muin S. Oztop for drawing some of the figures. We would like to extend our thanks to our Ph.D students, Isil Barutcu, Suzan Tireki, Semin Ozge Keskin, Elif Turabi and Nadide Seyhun for reviewing our book. We are happy to acknowledge the teaching assistants Aysem Batur and Incinur Hasbay for their great effort in drawing some of the figures, finding the examples and problems given in each chapter.

Last but not the least; we would like to thank our families for their continuous support throughout our academic career. With love, this work is dedicated to our parents who have patience and belief in us. Thank you for teaching us how to struggle the difficulties in life.

Ankara-TURKEY
October 29, 2005

Serpil Sahin
Servet Gülüm Sumnu

Contents

1—Size, Shape, Volume, and Related Physical Attributes	1
Summary	1
1.1 Size	1
1.2 Shape	3
1.3 Particle Size Distribution	8
1.4 Volume	15
1.4.1 Liquid Displacement Method	16
1.4.2 Gas Displacement Method	18
1.4.3 Solid Displacement Method	19
1.4.4 Expressions of Volume	20
1.5 Density	20
1.6 Porosity	24
1.7 Determination of Volume of Different Kinds of Pores	30
1.8 Shrinkage	33
Problems	35
References	36
 2—Rheological Properties of Foods	 39
Summary	39
2.1 Introduction to Rheology	39
2.2 Flow of Material	40
2.2.1 Newton's Law of Viscosity	40
2.2.2 Viscous Fluids	44
2.2.2.1 Newtonian Fluids	44
2.2.2.2 Non-Newtonian Fluids	44
2.2.3 Plastic Fluids	47
2.2.3.1 Bingham Plastic Fluids	47
2.2.3.2 Non-Bingham Plastic Fluids	47
2.2.4 Time Dependency	47
2.2.5 Solution Viscosity	49

2.3	Viscosity Measurement	50
2.3.1	Capillary Flow Viscometers	50
2.3.2	Orifice Type Viscometers	59
2.3.3	Falling Ball Viscometers	59
2.3.4	Rotational Viscometers	61
2.3.4.1	Concentric Cylinder (Coaxial Rotational) Viscometers	61
2.3.4.2	Cone and Plate Viscometers	64
2.3.4.3	Parallel Plate Viscometers	68
2.3.4.4	Single-Spindle Viscometers (Brookfield Viscometer)	69
2.3.5	Other Types of Viscometers	70
2.3.5.1	Vibrational (Oscillation) Viscometer	70
2.3.5.2	Bostwick Consistometer	70
2.4	Deformation of Material	71
2.5	Viscoelastic Behavior	75
2.5.1	Stress Relaxation Test	76
2.5.2	Creep Test	77
2.5.3	Dynamic Test (Oscillatory Test)	78
2.6	Extensional Flow	79
2.7	Mechanical Models	80
2.7.1	Elastic (Spring) Model	80
2.7.2	Viscous (Dashpot) Model	81
2.7.3	Combination Models	82
2.7.3.1	Maxwell Model	82
2.7.3.2	Kelvin-Voigt Model	84
2.7.3.3	Burger Model	85
2.8	Texture of Foods	90
2.8.1	Compression	90
2.8.2	Snapping-Bending	90
2.8.3	Cutting Shear	92
2.8.4	Puncture	92
2.8.5	Penetration	93
2.8.6	Texture Profile Analysis	93
2.9	Dough Testing Instruments	96
2.9.1	Farinograph and Mixograph	96
2.9.2	Extensograph and Alveograph	98
2.9.3	Amylograph	100
	Problems	100
	References	104

3—Thermal Properties of Foods	107
Summary	107
3.1 Fourier's Law of Heat Conduction	107
3.2 Thermal Conductivity	109
3.2.1 Prediction of Thermal Conductivity	112
3.2.1.1 Parallel Model	113
3.2.1.2 Series (Perpendicular) Model	114

3.2.1.3	Krischer Model	114
3.2.1.4	Maxwell-Eucken Model	114
3.2.1.5	Kopelman Model	115
3.2.1.6	Improved Thermal Conductivity Prediction Models	116
3.2.2	Measurement of Thermal Conductivity	120
3.2.2.1	Steady State Methods	121
3.2.2.2	Unsteady-State Methods	125
3.3	Specific Heat	139
3.3.1	Prediction of Specific Heat	139
3.3.2	Measurement of Specific Heat	142
3.3.2.1	Method of Mixture	142
3.3.2.2	Method of Guarded Plate	143
3.3.2.3	Method of Comparison Calorimeter	143
3.3.2.4	Adiabatic Agricultural Calorimeter	145
3.3.2.5	Differential Scanning Calorimeter (DSC)	145
3.3.2.6	Method of Calculated Specific Heat	148
3.4	Enthalpy and Latent Heat	148
3.5	Thermal Diffusivity	149
3.5.1	Indirect Prediction Method	149
3.5.2	Direct Measurement Methods	150
3.5.2.1	The Temperature History Method	150
3.5.2.2	Thermal Conductivity Probe	150
3.5.2.3	Dickerson Method	150
	Problems	151
	References	153
4	—Electromagnetic Properties	157
	Summary	157
4.1	Interaction of Objects with Light	157
4.2	Color	162
4.2.1	Color Measuring Equipments	164
4.2.1.1	Spectrophotometers	164
4.2.1.2	Colorimeters	165
4.2.2	Color Order Systems	166
4.2.2.1	Munsell Color System	166
4.2.2.2	CIE Color System	167
4.2.2.3	CIE L*a*b* (CIELAB) Color Spaces	167
4.2.2.4	Hunter Lab Color Space	169
4.2.2.5	Lovibond System	169
4.2.3	Color Differences	170
4.3	Dielectric Properties of Foods	173
4.3.1	Basic Principles of Microwave Heating	173
4.3.1.1	Ionic Interaction (Ionic Conduction)	173
4.3.1.2	Dipolar Rotation	173
4.3.2	Definition of Dielectric Properties	174
4.3.3	Effects of Moisture Content on Dielectric Properties	177
4.3.4	Effects of Temperature on Dielectric Properties	178

4.3.5	Effects of Composition of Foods on Dielectric Properties	180
4.3.5.1	Dielectric Properties of Salt Solutions	181
4.3.5.2	Dielectric Properties of Carbohydrates	181
4.3.5.3	Dielectric Properties of Proteins	185
4.3.5.4	Dielectric Properties of Fat	186
4.3.6	Assessment of Quality of Foods by Using Dielectric Properties	186
4.3.7	Measurement of Dielectric Properties	187
	References	189
5	—Water Activity and Sorption Properties of Foods	193
	Summary	193
5.1	Criteria of Equilibrium	193
5.2	Ideal Solution—Raoult's Law	196
5.3	Henry's Law	197
5.4	Colligative Properties	197
5.4.1	Boiling Point Elevation	197
5.4.2	Freezing Point Depression	200
5.4.3	Osmotic Pressure	203
5.5	Equilibria in Nonideal Systems—Fugacity and Activity	204
5.6	Water Activity	205
5.7	Prediction of Water Activity	206
5.8	Water Activity Measurement Methods	209
5.8.1	Measurements Based on Colligative Properties	210
5.8.1.1	Water Activity Determination by Vapor Pressure Measurement	210
5.8.1.2	Water Activity Determination by Freezing Point Depression	211
5.8.2	Measurements Based on Isopiestic Transfer	211
5.8.3	Measurements Using Hygrometers	211
5.8.4	Measurements Based on Hygroscopicity of Salts	212
5.9	Effects of Temperature on Water Activity	212
5.10	Effects of Pressure on Water Activity	212
5.11	Adjustment of Water Activity and Preparation of Moisture Sorption Isotherms	213
5.11.1	Hysteresis	216
5.11.2	Isotherm Models	218
	Problems	224
	References	226
6	—Surface Properties of Foods	229
	Summary	229
6.1	Surface Tension	229
6.2	Laplace Equation	232
6.3	Kelvin Equation	234
6.4	Surface Activity	235
6.5	Interfacial Tension	237
6.6	Young and Dupre' Equations	237

6.7	Colloidal Systems in Foods	239
6.7.1	Sols	239
6.7.2	Gels	240
6.7.3	Emulsions	240
6.7.4	Foams	243
6.8	Measurement of Contact Angle and Surface Tension	244
6.8.1	Contact Angle Measurement Methods	244
6.8.2	Surface Tension Measurement Methods	245
	Problems	248
	References	248
	Index	251