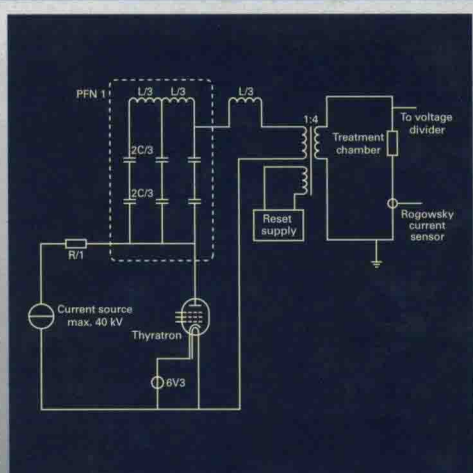




Food preservation by pulsed electric fields

From research to application

Edited by H. L. M. Lelieveld, S. Notermans
and S. W. H. de Haan

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CRC Press

Boca Raton Boston New York Washington, DC

WOODHEAD PUBLISHING LIMITED

Cambridge England

Published by Woodhead Publishing Limited, Abington Hall, Abington,
Cambridge CB21 6AH, England
www.woodheadpublishing.com

Published in North America by CRC Press LLC, 6000 Broken Sound Parkway, NW,
Suite 300, Boca Raton, FL 33487, USA

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British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library.

Library of Congress Cataloging in Publication Data
A catalog record for this book is available from the Library of Congress.

Woodhead Publishing ISBN 978-1-84569-058-8 (book)
Woodhead Publishing ISBN 978-1-84569-383-1 (e-book)
CRC Press ISBN 978-1-4200-4395-2
CRC Press order number WP4395

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Typeset in India by Replika Press Pvt Ltd.
Printed by TJ International Ltd, Padstow, Cornwall, England

Food preservation by pulsed electric fields

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Preface

Pulsed electric field (PEF) processing seems to be an ideal and relatively simple solution to the problem of producing shelf stable food products that retain the characteristics of fresh food. Preservation by pulsed electric fields destroys the microorganisms in the food, but colour, flavour and levels of vitamins and antioxidants are unaffected. The technology was conceived almost 100 years ago,¹ but was not pursued seriously until the 1960s. At that time, commercial application was far off and even scaling up of the technology must have seemed close to impossible. In the 1980s, however, when consumers started to question the quality of canned and other foods preserved by thermal methods, novel preservation technologies gradually received more attention from several research groups. Early results tempted Maxwell Technologies in the USA (through a subsidiary named 'PurePulse Technologies') to market PEF equipment for the preservation of food. It transpired, though, that this move was premature. The inactivation of microorganisms by PEF was more complex than envisaged and results of pilot plant studies were disappointing. Maxwell closed down PurePulse Technologies in 2002. In particular, the influence of the equipment on the microbiological results had been greatly underestimated. Attempting to meet consumer demands in Europe and military requirements in the USA, governments supported further research in collaboration with the food industry. In the Netherlands, a large research and development consortium was established, consisting of several research institutes and R&D departments of multinational food companies. They worked in co-operation with engineers from the High-Voltage Laboratory of the Technological University of Delft, who were to deal with the electrotechnical challenges involved in PEF preservation of food. The project resulted in the development and testing of a fairly large scale pilot plant and the establishment of rules for scale-up to production size.

Despite the significant progress made this decade, which is due to the co-

¹ A.K. Anderson and R. Finkelstein, Electro-Pure process of treating milk, *Journal of Dairy Science* 2 (1919), 374-407.

operation of many scientists, engineers and technologists, in particular in Europe and the USA, application is still very limited. It is hoped that this book will show that the technology is maturing rapidly and that it will help industry to overcome its hesitations regarding preservation of food by pulsed electric fields.

For a new food preservation technology to be introduced, insight is not only required into the effects of the technology on the inactivation of microorganisms and enzymes and on product nutritional and organoleptic characteristics; this book therefore also covers occupational safety, toxicological aspects, consumer acceptance, regulatory requirements and the promising economic aspects of PEF technology. Combining the technology with other preservation methods has not been forgotten and last, but not least, we have included a chapter discussing the potential future developments of PEF technology, which may include the preservation of food by PEF after packaging.

Huub Lelieveld, Servé Notermans and Sjoerd de Haan

Contents

<i>Contributor contact details</i>	<i>xiii</i>
<i>Preface</i>	<i>xix</i>
1 Preservation of food by pulsed electric fields: An introduction	1
<i>S. Notermans, Foundation Food Micro and Innovation, The Netherlands</i>	
1.1 The need to preserve food	1
1.2 Major preservation technologies	3
1.3 Current developments and demands	5
1.4 Current needs	5
1.5 References	7
2 History of pulsed electric field treatment	9
<i>S. Toepfl, V. Heinz, Deutsches Institut für Lebensmitteltechnik (DIL) e.V., Germany, and D. Knorr, Berlin University of Technology, Germany</i>	
2.1 Introduction	9
2.2 The evolution of PEF techniques	10
2.3 Research work on PEF applications from 1980s to 2004	19
2.4 Applications of PEF in food and bio-processing	24
2.5 Present situation and future industrial exploitation	28
2.6 Outlook and conclusions	30
2.7 References	31
Part I Technology	
3 Circuitry and pulse shapes in pulsed electric field treatment of food	43
<i>S. W. H. de Haan, Delft University of Technology, The Netherlands</i>	
3.1 Introduction	43
3.2 Requirements	44

3.3	Pulse shapes	47
3.4	Circuitry	48
3.5	Switches	57
3.6	Other components	60
3.7	Examples of applied systems	61
3.8	Miscellaneous	63
3.9	Trends in pulsed power technology	66
3.10	Sources of further information	67
3.11	References	67
4	Chamber design and process conditions for pulsed electric field treatment of food	70
	<i>H. F. M. van den Bosch (formerly Delft University of Technology), The Netherlands</i>	
4.1	Introduction	70
4.2	Chamber geometries	70
4.3	Electric field calculations	75
4.4	Residence time distribution	78
4.5	Wall temperature	79
4.6	Experimental set-up	84
4.7	Temperature measurements	85
4.8	Other experimental results	89
4.9	Conclusions and future trends	91
4.10	References	92
5	Electrochemistry in pulsed electric field treatment chambers	94
	<i>B. Roodenburg, Delft University of Technology, The Netherlands</i>	
5.1	Introduction	94
5.2	Theory	95
5.3	Experiments	100
5.4	Treatment chamber lifetime	105
5.5	Legislation	105
5.6	Conclusions	106
5.7	References	106
6	Hygienic design for pulsed electric field installations	108
	<i>C. Smit and W. de Haan, Stork Food & Dairy Systems, The Netherlands</i>	
6.1	Introduction	108
6.2	Hygienic demands	109
6.3	Construction elements	109
6.4	Process aspects	110
6.5	Conclusions	117
6.6	References	117

7	Technical and occupational safety requirements when treating foods by pulsed electric fields	118
	<i>P. H. F. Morshuis, Delft University of Technology, The Netherlands</i>	
7.1	Introduction	118
7.2	Potential safety hazards	118
7.3	Technical safety requirements	120
7.4	Occupational safety requirements	121
7.5	Food safety	122
7.6	Conclusions	123
7.7	References	123

Part II Product safety and quality

8	Microbial inactivation kinetics of pulsed electric field treatment	127
	<i>M. B. Fox, NIZO Food Research, The Netherlands</i>	
8.1	Introduction	127
8.2	Factors affecting inactivation kinetics	127
8.3	Kinetic models	130
8.4	Discussion	133
8.5	Sources of further information	133
8.6	References	134
9	Probable mechanisms of microorganism inactivation by pulsed electric fields	138
	<i>G. Saulis, Vytautas Magnus University, Lithuania, and P. C. Wouters, Unilever Research & Development Vlaardingen, The Netherlands</i>	
9.1	Introduction	138
9.2	Models used for the description of inactivation kinetics	139
9.3	Mechanisms of microorganism inactivation by PEF	140
9.4	Discussion	148
9.5	Future trends	150
9.6	Sources of further information	150
9.7	Acknowledgements	151
9.8	References	151
10	Adaptation potential of microorganisms treated by pulsed electric fields	156
	<i>D. Rodrigo, M. Zúñiga, A. Rivas and A. Martínez, Instituto de Agroquímica y Tecnología de Alimentos, Spain, and S. Notermans, Foundation Food Micro and Innovation, The Netherlands</i>	
10.1	Introduction	156
10.2	Pulsed electric field technology	157

10.3	Sub-lethal damage from PEF	157
10.4	Possibility of transformation	159
10.5	Assessment of the risk of transforming <i>Lact. casei</i> by PEF treatment	160
10.6	Results and discussion	161
10.7	Conclusions	163
10.8	References	163
11	Hurdle technology and the preservation of food by pulsed electric fields	165
	<i>I. Álvarez, University of Zaragoza, Spain, and</i>	
	<i>V. Heinz, Deutsches Institut für Lebensmitteltechnik (DIL) e.V., Germany</i>	
11.1	Introduction	165
11.2	Combination of PEF and temperature	167
11.3	Combination of PEF and pH	169
11.4	Combination of PEF and antimicrobials	170
11.5	Combination of PEF and high pressure	172
11.6	Combination of PEF and ultrasound	173
11.7	Future trends	174
11.8	Sources of further information	174
11.9	References	175
12	Validating the safety of foods treated by pulsed electric fields	178
	<i>L. Keener, International Product Safety Consultants, Inc, USA</i>	
12.1	Introduction	178
12.2	Regulatory considerations	179
12.3	General principles of process validation	182
12.4	Validating PEF-treated products	185
12.5	Validating the process performance	190
12.6	Future trends	195
12.7	Conclusions	196
12.8	Summary	198
12.9	References	198
12.10	Bibliography	200
13	Toxicological aspects of preservation of food by pulsed electric fields	201
	<i>A. M. Matser, H. J. Schuten, H. C. Mastwijk, Food Technology Centre Wageningen UR, The Netherlands, and A. Lommen, RIKILT-Institute of Food Safety, The Netherlands</i>	
13.1	Introduction	201
13.2	Sources of possible toxicological hazards	202
13.3	Metal release by electrode degradation	203
13.4	Electrochemistry	204
13.5	Possible changes in PEF-treated products: Substantial equivalence study	205

13.6	Conclusions and future trends	209
13.7	Acknowledgement	210
13.8	References	210
14	Impact of pulsed electric fields on food enzymes and shelf-life	212
	<i>P. Elez-Martínez, O. Martín-Belloso, Universitat de Lleida, Spain and D. Rodrigo, F. Sampedro, Instituto de Agroquímica y Tecnología de Alimentos, Spain</i>	
14.1	Introduction	212
14.2	Enzyme inactivation by PEF	212
14.3	Shelf-life of food processed by PEF	227
14.4	Future trends	241
14.5	Nomenclature	242
14.6	References	242
Part III Applications		
15	Public acceptance of pulsed electric field processing	249
	<i>L. Frewer and A. Fischer, Social Sciences Group Wageningen UR, The Netherlands</i>	
15.1	Introduction	249
15.2	A historical perspective on risk communication	250
15.3	The psychology of risk	252
15.4	The introduction of GM foods in Europe	253
15.5	Consumer perceptions of risk management	253
15.6	Other issues of relevance to the introduction of PEF technology	254
15.7	References	254
16	Economic aspects of pulsed electric field treatment of food	257
	<i>H. Hoogland, Unilever Research & Development Vlaardingen, The Netherlands, and W. de Haan, Stork Food & Dairy Systems, The Netherlands</i>	
16.1	Introduction	257
16.2	PEF for pasteurisation	258
16.3	PEF as a processing aid	262
16.4	Quality	263
16.5	Conclusions	264
16.6	Acknowledgements	264
16.7	References	265
17	Applications of pulsed electric fields for food preservation	266
	<i>B. Altunakar, S. R. Gurram and G. V. Barbosa-Cánovas, Washington State University, USA</i>	
17.1	Introduction	266
17.2	Historical overview	267