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DETERMINATION OF THE DISTRIBUTION OF WATER DROPLET SIZES IN BUTTER AND MARGARINE USING PULSED FIELD GRADIENT–NMR AND CONFOCAL SCANNING LASER MICROSCOPY

This thesis was presented in partial fulfillment of the requirements for degree of Master of Science in Chemistry at Massey University

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1999

献给：

我的父母，

姐妹，

毛毛，

爱我的人.

Abstract

PFG-NMR has been used to determine the distribution of water droplets in emulsions. Especially, it has been used to measure the samples with high optical dense systems and highly viscous systems Butters and Margarines).

To refine the method, the optimum measuring condition was investigated. It included delay time (Δ) between the field gradient pulses, τ null (τ_0), gradient strength (G), water self-diffusion coefficients (D) and sampling techniques. Under the optimum conditions the water droplet size distributions of commercial butters, experimental butters and margarines were measured.

Experimental results showed that PFG-NMR is an accurate, fast method to determine the water droplet size distributions of the butters and margarines. Also, it is can be used to investigate the properties of dispersed phase in emulsions. Especially, the method is suitable not only in the laboratory but also in the factory environment. The method was able to distinguish different distributions in butters of the same water content but with different manufacturing techniques. Differences in the distributions of water droplets were also obtained when comparing butters made by the same manufacturing technique but with different water contents.

To confirm the results from PFG-NMR, confocal scanning laser microscopy (CSLM) was chosen to determine the droplet size distributions and the moisture contents of samples. Comparison between PFG-NMR and CSLM shows limitations in the latter techniques and its uses are limited.

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TABLE OF CONTENTS

Dedication i
Abstract i
Acknowledgments ii
Table of Contents v
List of Figures ix
List of Tables xiii

1.0 Introduction 1

2.0 Background theories and techniques 11

2.1 Pulse field gradient NMR method (PFG-NMR) 11
2.1.1 Basic theory of pulse field gradient NMR method 11
2.1.2 Droplet size application for NMR-minispec 19
2.1.3 Droplet size distribution 19
2.2 Confocal scanning laser microscopy (CSLM) 22
2.2.1 Basic theory of confocal scanning laser microscopy 22
2.2.2 Z-series experiment 26

3.0 Experimental methods and materials 28

3.1 Instrumentation 28
3.1.1 NMR spectrometers 28
3.1.2 Confocal scanning laser microscopy 28

3.2 Samples 29
3.3 Sample preparation 29
3.3.1 NMR samples 29
3.3.2 Confocal scanning laser microscopy (CSLM) 31
3.3.2.1 Dye preparation 31
3.3.2.2 Preparation of CSLM sample 31
3.4 Data analysis 31

4.0 Results and discussions 32

4.1 NMR measurements 32
4.1.1 Pulse sequence used in diffusion measurements 32
4.1.2 Choice of optimum measuring conditions 32
4.1.2.1 The delay time Δ between the field gradient pulses 32
4.1.2.2 τ null (τ_0) 33
4.1.2.3 Gradient strength (*G*) 35
4.1.3 Choice of water diffusion coefficient 39
4.1.3.1 Determinations of water self-diffusion coefficients 39
4.1.3.2 effect of choice of D on the water droplet size distribution 41
4.1.4 Sampling techniques 42
4.1.5 Distribution of water droplet size in commercial and experimental butters 45
4.1.5.1 Distribution curves of water droplet sizes by volume 46
4.1.5.2 The distributions of water droplet sizes in experimental butters with different moisture contents 48
4.1.5.3 Distributions of water droplet sizes in butters made using different manufacturing techniques 50

4.2 Confocal microscopy 52
4.2.1 The Sampling 52
4.2.1.1 Use of microscope slide in dyeing sample 52
4.2.1.2 Small cube of sample stained in a beaker 53
4.2.1.3 Uses of copper dish 56
4.2.2 Dyeing techniques 58
4.2.2.1 Comparisons between Nile Blue in glycerol and Nile Red in corn oil 58
4.2.2.2 Nile Blue 59
4.2.2.3 Comparisons between Nile Blue in Milli-Q water and Nile red in propylene glycol 61
4.2.2.4 Butter samples 63
4.2.3 Choosing the magnifications of images 66
4.2.4 Z-series experiments 71
4.2.5 Analytical program of the droplet sizes and droplet numbers in emulsions by computer 71
4.2.6 The distributions of water droplet numbers 75
4.2.7 The distributions of droplet volume 76
4.2.8 The measurements of moisture contents 78

4.3 Comparison between the results of the PFG-NMR method and the results of the confocal scanning laser microscopy 81
4.3.1 Water droplet size by volume distributions 81
4.3.2 Irregular droplets 83
4.4 Comparison between the results of low resolution NMR and high resolution NMR 86

5.0 Conclusions and future works 87

6.0 References 90

7.0 Appendix 98

Appendix 1. The Hahn spin-echo experiment and the Hahn spin-echo experiment with pulse field gradient 98

Appendix 2. Self-diffusion coefficients 105

Appendix 3. The images of samples from CSLM 110

Appendix 4. Conversion of the droplet diameter 120

List of Figures

Figure 1. General view of the fine structure of butter 2
Figure 2. Detailed views of the structure of butter 3
Figure 3. High resolution proton NMR spectra of butter 13
Figure 4. Precession of a magnetic moment μ 15
Figure 5. The pulsed field gradient spin-echo pulse sequence 16
Figure 6. The improved pulsed field gradient spin-echo pulse sequence 17
Figure 7. The recovery of Mt following inversion by the application of a 180^0 pulse at time t=0 17
Figure 8. Droplet size distributions for a log-normal distribution 20
Figure 9. Droplet size distribution expressed as the relative frequency vs the ln *d* 21
Figure 10. Optical arrangement of the confocal microscope 23
Figure 11. Diagram of the excitation beam and the reflected and fluorescent light in an incident light confocal system 24
Figure 12. Optical scanning sectioning length as function of the numerical aperture. 25
Figure 13. Schematic diagram of the construction of a x-z images in an inverted microscope. 26
Figure 14. Serial confocal optical sections of a z-series through a butter 27
Figure 15. Butter sampling in NMR measurement 30
Figure 16. Butter sampling in CSLM exploration 31
Figure 17. The relationship between the spin-echo amplitude and the interval between two pulsed field gradients 33
Figure 18. The relationship between the echo height ratio and pfg width for MAR-1 margarine 37
Figure 19. The relationship between the echo height ratio and pfg width for DRI-24 butter 38

Figure 20. The relationship between the echo height ratio and pfg width for STD-1 butter 38
Figure 21. Distribution curve of water droplet size in STD-1 butter using older sampling probe 42
Figure 22. The butter sampling probes 44
Figure 23. Distribution of water droplet size in STD-1 butter using new sample probe 45
Figure 24. Distribution curve of water droplet size by volume in STD-1 butter at 5^0C 46
Figure 25. Distribution curve of water droplet size by volume in DRI-24 butter at 5^0C 47
Figure 26. Distribution curve of water droplet size by volume in MAR-1 margarine at 5^0C 47
Figure 27. Distributions of water droplet sizes by volume in experimental butters with different moisture contents 48
Figure 28. The droplet distributions by volume of the SPE-1 and the SPE-2 butters with close moisture contents 51
Figure 29. The sampling technique of CSLM using a microscope slide 53
Figure 30. The microstructure of DRI-24 butter obtained from a sample prepared using a microscope slide 53
Figure 31. The microstructure of DRI-32 butter obtained from a sample prepared using a microscope slide 54
Figure 32. The microstructure of STD-1 butter obtained from a sample prepared by stained a cube of butter in a beaker 55
Figure 33. The microstructure of DRI-24 butter obtained from a sample prepared by stained a cube of butter in a beaker 55
Figure 34. The microstructure of STD-1 butter obtained using a sample prepared in a copper dish 56

Figure 35. The microstructure of DRI-24 butter obtained using a sample prepared in a copper dish 57
Figure 36. The microstructure of STD-1butter obtained from a sample prepared using a microscope slide 58
Figure 37. The microstructure of STD-1butter stained with Nile Blue in Milli-Q water 59
Figure 38. The microstructure of DRI-24 butter stained with Nile Blue in Milli-Q water 60
Figure 39. The microstructure of MAR-1 margarine stained with Nile Blue in Milli-Q water 60
Figure 40. The microstructure of MAR-1 margarine stained with Nile Red in propylene glycol 61
Figure 41. The microstructure of DRI-24 butter stained with Nile Red in propylene glycol 62
Figure 42. The microstructure of STD-1 butter stained with Nile Blue in Milli-Q water 62
Figure 43. The microstructure of STD-1 butter stained with Nile Red in propylene glycol (copper dish) 63
Figure 44. The microstructure of DRI-24 butter stained with Nile Red in propylene glycol (copper dish) 64
Figure 45. The microstructure of MAR-1 margarine stained with Nile Red in propylene glycol (copper dish) 64
Figure 46. The microstructure of SPE-1 butter stained with Nile Red in propylene glycol (copper dish) 65
Figure 47. The microstructure of SPE-2 butter stained with Nile Red in propylene glycol (copper dish) 65
Figure 48. The microstructure of SPE-1 butter with 16x magnification 67
Figure 49. The microstructure of SPE-1 butter with 40x magnification 67

Figure 50. The microstructure of SPE-1 butter with 63x magnification 67
Figure 51. The microstructure of SPE-2 butter with 16x magnification 68
Figure 52. The microstructure of SPE-2 butter with 40x magnification 68
Figure 53. The microstructure of SPE-2 butter with 63x magnification 68
Figure 54. The distribution of water droplet number in SPE-1 butter with different magnifications 69
Figure 55. The distribution of water droplet number in SPE-2 butter with different magnifications 70
Figure 56. The z-series experiment of SPE-1 butter 72
Figure 57. The z-series experiment of SPE-2 butter 73
Figure 58. The distribution of water droplet numbers in STD-1 butter by CSLM 75
Figure 59. The distribution of water droplet numbers in MAR-1 margarine by CSLM 76
Figure 60. The distribution of water droplet volume of STD-1 butter by CSLM 77
Figure 61. The distribution of water droplet volume in MAR-1 margarine by CSLM 78
Figure 62. The distribution of water droplets by volume in STD-1 butter obtained from PFG-NMR and CSLM 82
Figure 63. The distribution of water droplets by volume in MAR-1 margarine obtained from PFG-NMR and CSLM 82
Figure 64. The distributions of water droplet sizes of SPE-1 butter and SPE-2 butter by PFG-NMR method 84
Figure 65. The images of SPE-1 butter by CSLM 85
Figure 66. The images of SPE-2 butter by CSLM 85
Figure 67. The R vs δ distributions of STD-1 butter between low resolution NMR and high resolution NMR 87

List of Tables

Table 1. T_1 and T_2 results 34

Table 2. The distribution of water droplet size in STD-1 butter with different τ_0 35

Table 3. The water droplet size distributions by volume of margarine, experimental butter and commercial butter from *R* vs δ curves using two gradient amplitudes 36

Table 4. Diffusion coefficients in aqueous phase extracted from samples 40

Table 5. The distributions of water droplet sizes in MAR-1 using real aqueous phase to calibrate low instrument 41

Table 6. Distributions of water droplet sizes in butters by older sampler 43

Table 7. Distributions of water droplet sizes in butters by new sampler 44

Table 8. Moisture contents of NZDRI experimental butters 49

Table 9. Moisture contents of SPE-1 and SPE-2 butters 50

Table 10. Results of using VIPS to determine the droplet sizes and numbers of SPE-1 butter 74

Table 11. Moisture contents of SPE-1 and SPE-2 butters from CSLM 79

Table 12. Moisture contents of STD-1 butter and MAR-1 margarine 81