APPENDICES

APPENDICES

Appendix A Influence of Viscosity on Fiber Size

Table A1 Electrospun Fiber Size as a Function of Viscosity at 7.5 kV

Viscosity (cp.)	Fiber size in μm (Mean)
EPO 25% w/v = 117	2.153±0.504
EPO 30% w/v = 386	4.254±1.464
L100 10% w/v = 25.4	0.176±0.048
L100 15% w/v = 162	1.439±0.258
L100 20% w/v = 1055	3.914±2.295
RLPO 20% w/v = 47.2	0.201±0.071
RLPO 25% w/v = 259	0.403±0.077
RLPO 30% w/v = 520	3.215±0.673

Table A2 Electrospun Fiber Size as a Function of Viscosity at 11.25 kV

Viscosity (cp.)	Fiber size in μm (Mean)
EPO 25% w/v = 117	2.194±0.531
EPO 30% w/v = 386	5.203±1.714
L100 10% w/v = 25.4	0.199±0.044
L100 15% w/v = 162	1.705±0.579
L100 20% w/v = 1055	4.149±3.530
RLPO 20% w/v = 47.2	0.488±0.295
RLPO 25% w/v = 259	1.394±0.260
RLPO 30% w/v = 520	4.230±0.945

Table A3 Electrospun Fiber Size as a Function of Viscosity at 15 kV

Viscosity (cp.)	Fiber size in μm (Mean)
EPO 25% w/v = 117	2.699±0.938
EPO 30% w/v = 386	5.521±1.998
L100 10% w/v = 25.4	0.199±0.056
L100 15% w/v = 162	2.424±0.797
L100 20% w/v = 1055	2.961±0.992
RLPO 20% w/v = 47.2	0.902±0.532
RLPO 25% w/v = 259	1.563±0.226
RLPO 30% w/v = 520	3.571±0.835

Table A4 Electrospun Fiber Size as a Function of Viscosity at 18.75 kV

Viscosity (cp.)	Fiber size in μm (Mean)
EPO 25% w/v = 117	2.622±0.700
EPO 30% w/v = 386	3.918±2.008
L100 10% w/v = 25.4	0.203±0.069
L100 15% w/v = 162	3.138±0.645
L100 20% w/v = 1055	3.244±1.092
RLPO 20% w/v = 47.2	1.088±0.386
RLPO 25% w/v = 259	1.722±0.247
RLPO 30% w/v = 520	3.646±0.899

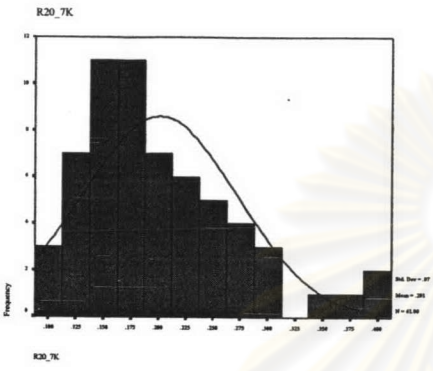
Table A5 Electrospun Fiber Size as a Function of Viscosity at 22.5 kV

Viscosity (cp.)	Fiber size in μm (Mean)
EPO 25% w/v = 117	2.560±0.757
EPO 30% w/v = 386	4.806±1.565
L100 10% w/v = 25.4	0.203±0.069
L100 15% w/v = 162	3.394±0.975
L100 20% w/v = 1055	5.196±1.611
RLPO 20% w/v = 47.2	1.278±0.378
RLPO 25% w/v = 259	1.739±0.276
RLPO 30% w/v = 520	3.744±1.256

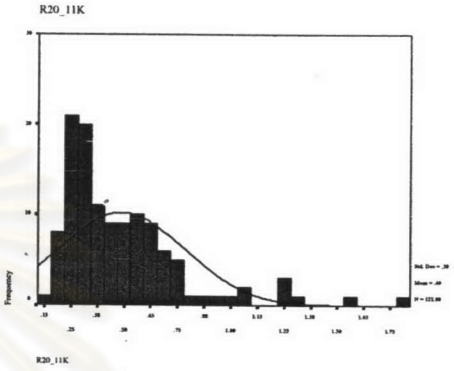
Table B1. Average fiber diameters of as-spun Eudragit EPO, Eudragit L100, and Eudragit RLPO fibers as a function of applied potential and polymer concentration.

Conditions		Fiber size in μm (Mean)	Standard Deviation
EPO 25%	at 7.5 kV	2.153	0.504
	at 11.25 kV	2.194	0.531
	at 15 kV	2.699	0.938
	at 18.75 kV	2.622	0.700
	at 22.5 kV	2.560	0.757
EPO 30%	at 7.5 kV	4.254	1.464
	at 11.25 kV	5.203	1.714
	at 15 kV	5.521	1.998
	at 18.75 kV	3.918	2.008
	at 22.5 kV	4.806	1.565
L100 10%	at 7.5 kV	0.176	0.048
	at 11.25 kV	0.199	0.044
	at 15 kV	0.199	0.056
	at 18.75 kV	0.203	0.069
L100 15%	at 7.5 kV	1.439	0.258
	at 11.25 kV	1.705	0.579
	at 15 kV	2.424	0.797
	at 18.75 kV	3.138	0.645
	at 22.5 kV	3.394	0.975
L100 20%	at 7.5 kV	3.914	2.295
	at 11.25 kV	4.149	3.530
	at 15 kV	2.961	0.992
	at 18.75 kV	3.244	1.092
	at 22.5 kV	5.196	1.611
RLPO 20%	at 7.5 kV	0.201	0.071
	at 11.25 kV	0.488	0.295
	at 15 kV	0.902	0.532
	at 18.75 kV	1.088	0.386
	at 22.5 kV	1.278	0.378
RLPO 25%	at 7.5 kV	0.403	0.077
	at 11.25 kV	1.394	0.260
	at 15 kV	1.563	0.226
	at 18.75 kV	1.722	0.247
	at 22.5 kV	1.739	0.276
RLPO 30%	at 7.5 kV	3.215	0.673
	at 11.25 kV	4.230	0.945
	at 15 kV	3.571	0.835
	at 18.75 kV	3.646	0.899
	at 22.5 kV	3.744	1.256

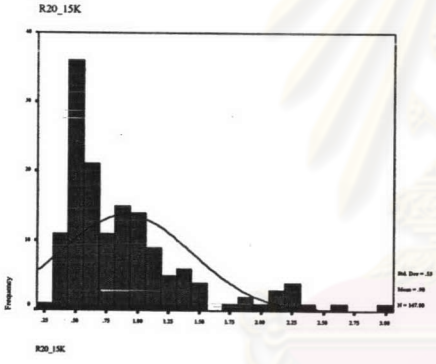
Appendix C Histogram Chart of Electrospun Fiber Size



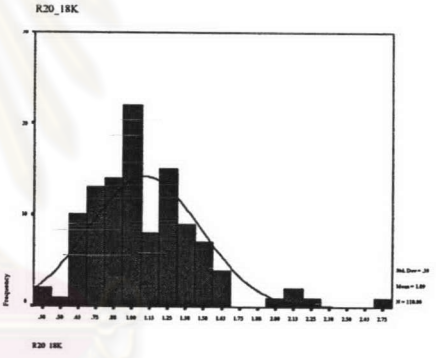
20% RLPO at 7.5 kV 15cm



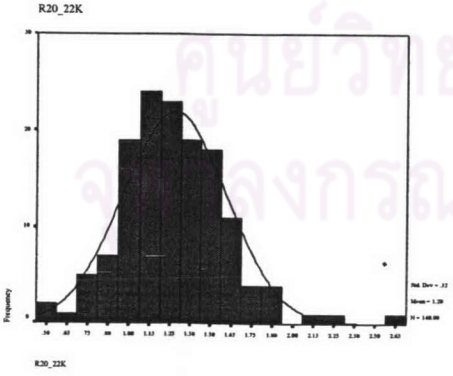
20% RLPO at 11.25 kV 15cm



20% RLPO at 15 kV 15cm

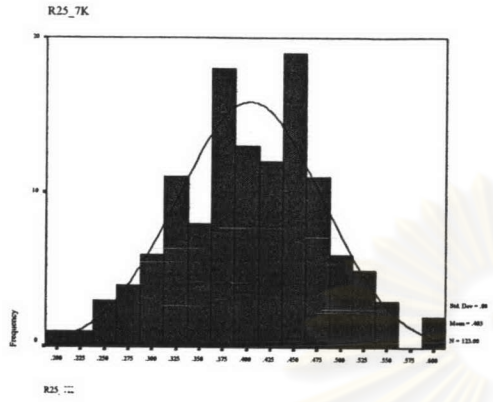


20% RLPO at 18.75 kV 15cm

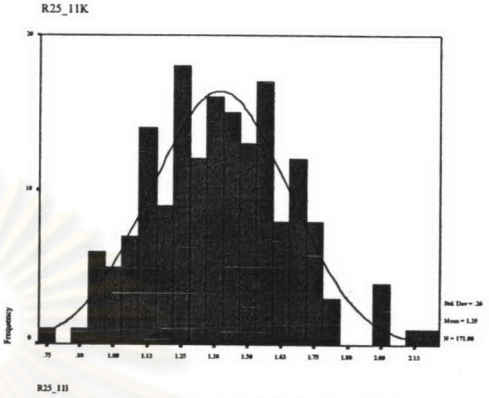


20% RLPO at 22.5 kV 15cm

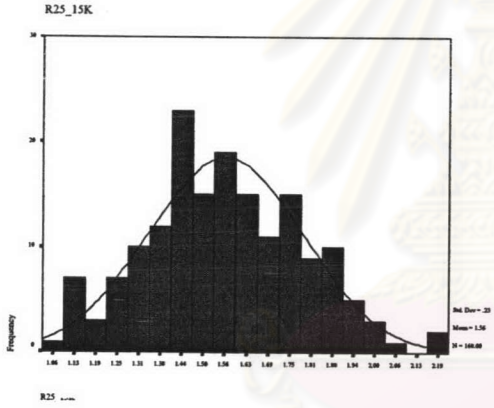
Figure 23 The histogram of Eudragit RLPO in EtOH at 20%w/v 15 cm



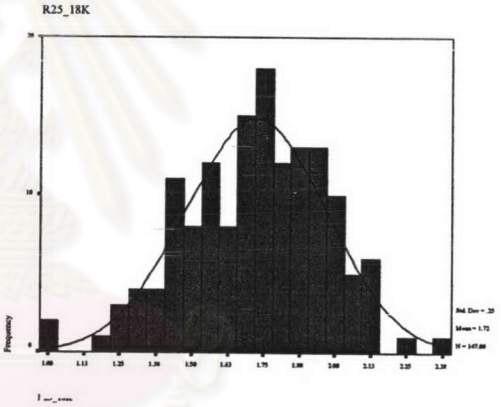
25% RLPO 7.5kV 15cm



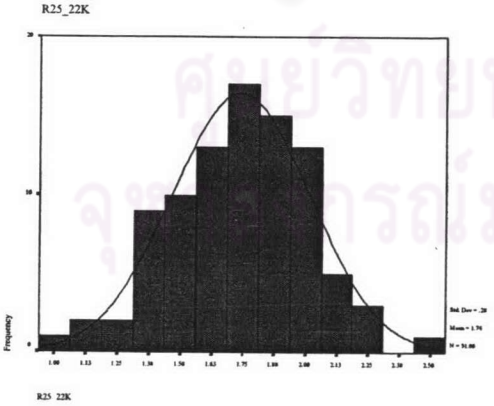
25% RLPO 11.25kV 15cm



25% RLPO 15kV 15cm

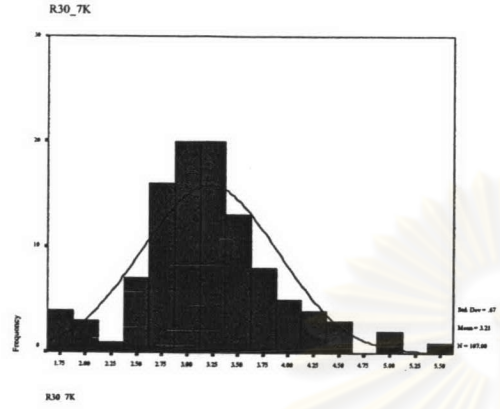


25% RLPO 18.75kV 15cm

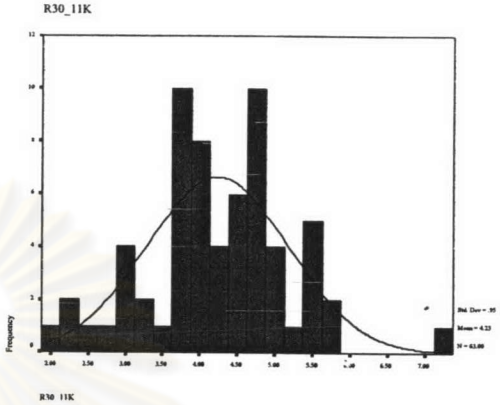


25% RLPO 22.5kV 15cm

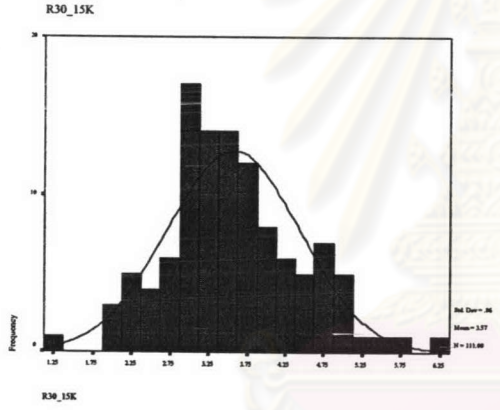
Figure 24 The histogram of Eudragit RLPO in EtOH at 25%w/v 15 cm



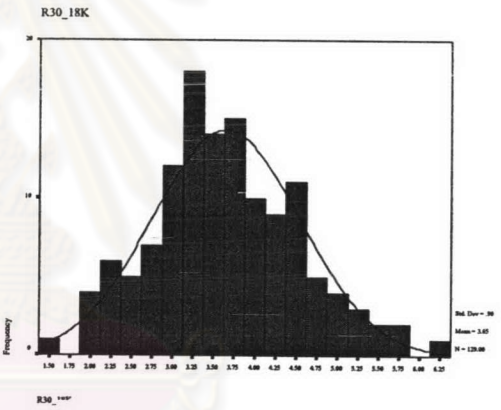
30% RLPO 7.5kV 15cm



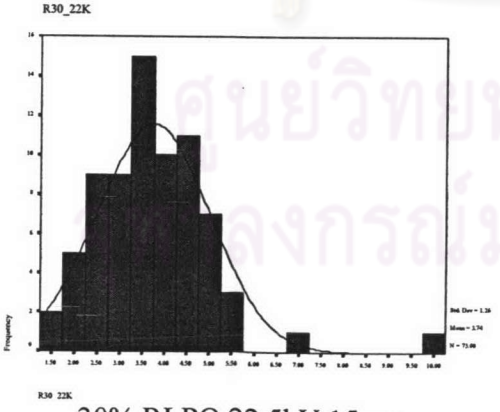
30% RLPO 11.25kV 15cm



30% RLPO 15kV 15cm

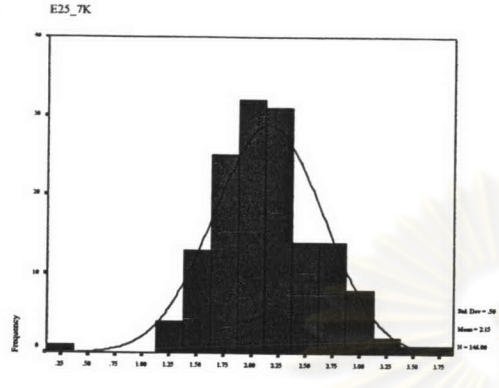


30% RLPO 15kV 15cm

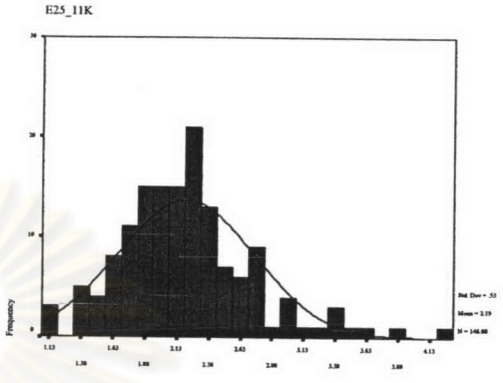


30% RLPO 22.5kV 15cm

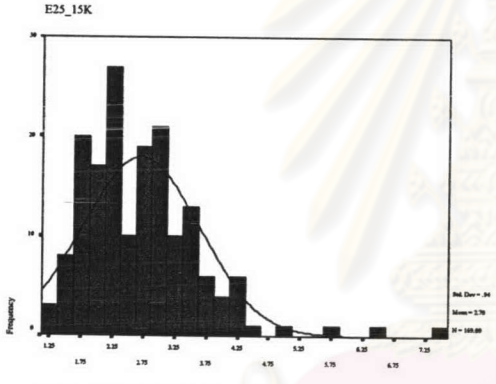
Figure 25 The histogram of Eudragit RLPO in EtOH at 30%w/v 15 cm



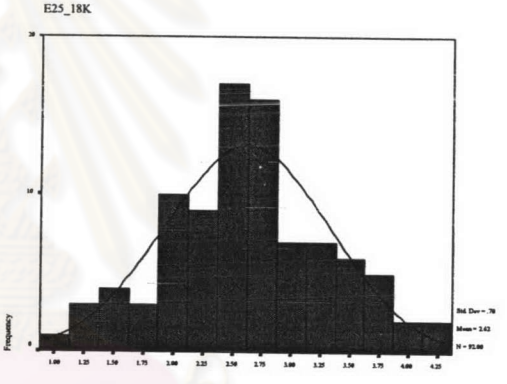
25% EPO 7.5kV 15cm



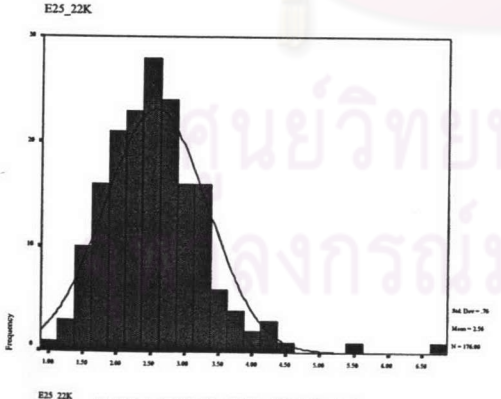
25% EPO 11.25kV 15cm



25% EPO 15kV 15cm



25% EPO 18.75kV 15cm



25% EPO 22.5kV 15cm

Figure 26 The histogram of Eudragit EPO in EtOH at 25%w/v 15 cm

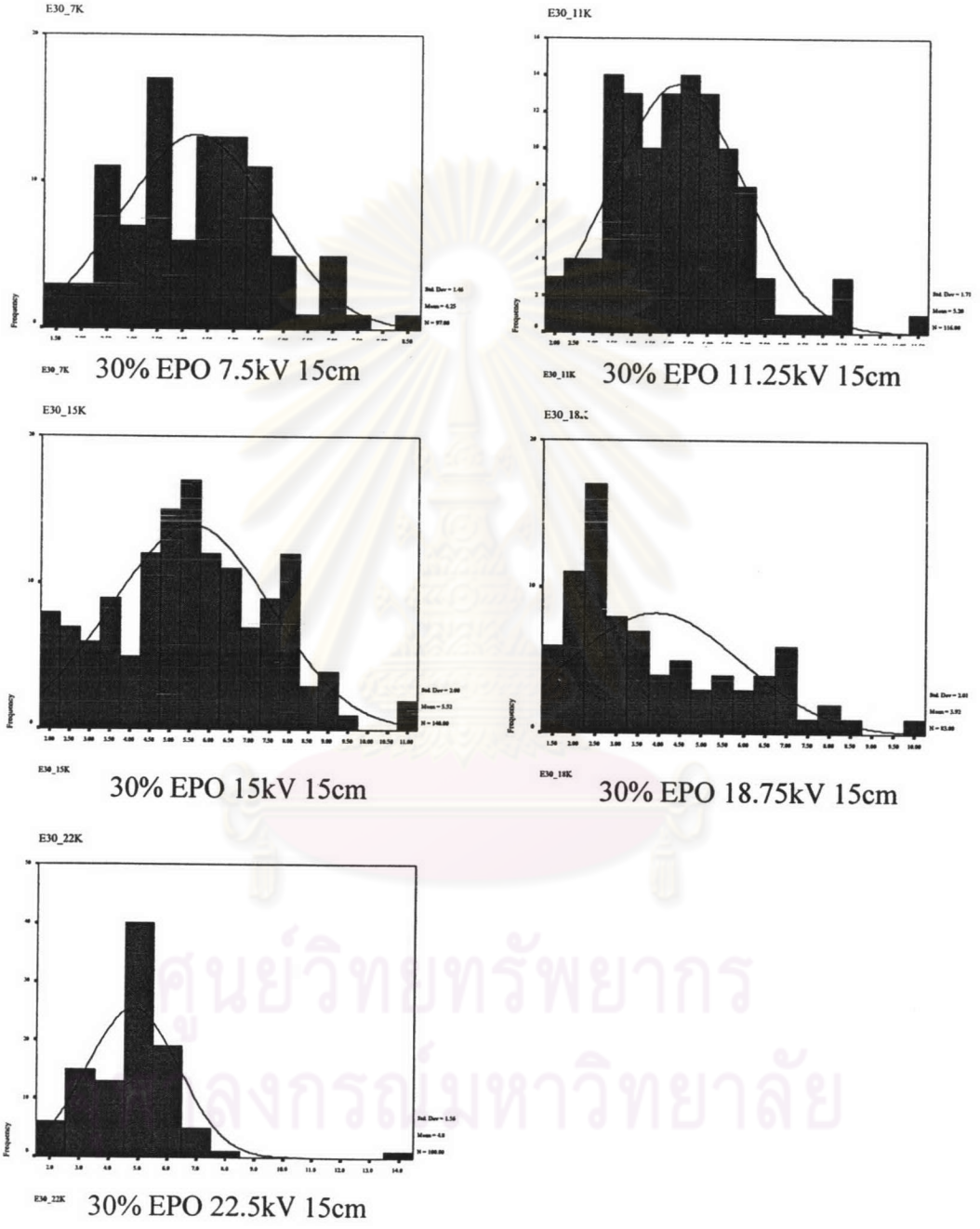


Figure 27 The histogram of Eudragit RLPO in EtOH at 30%w/v 15 cm

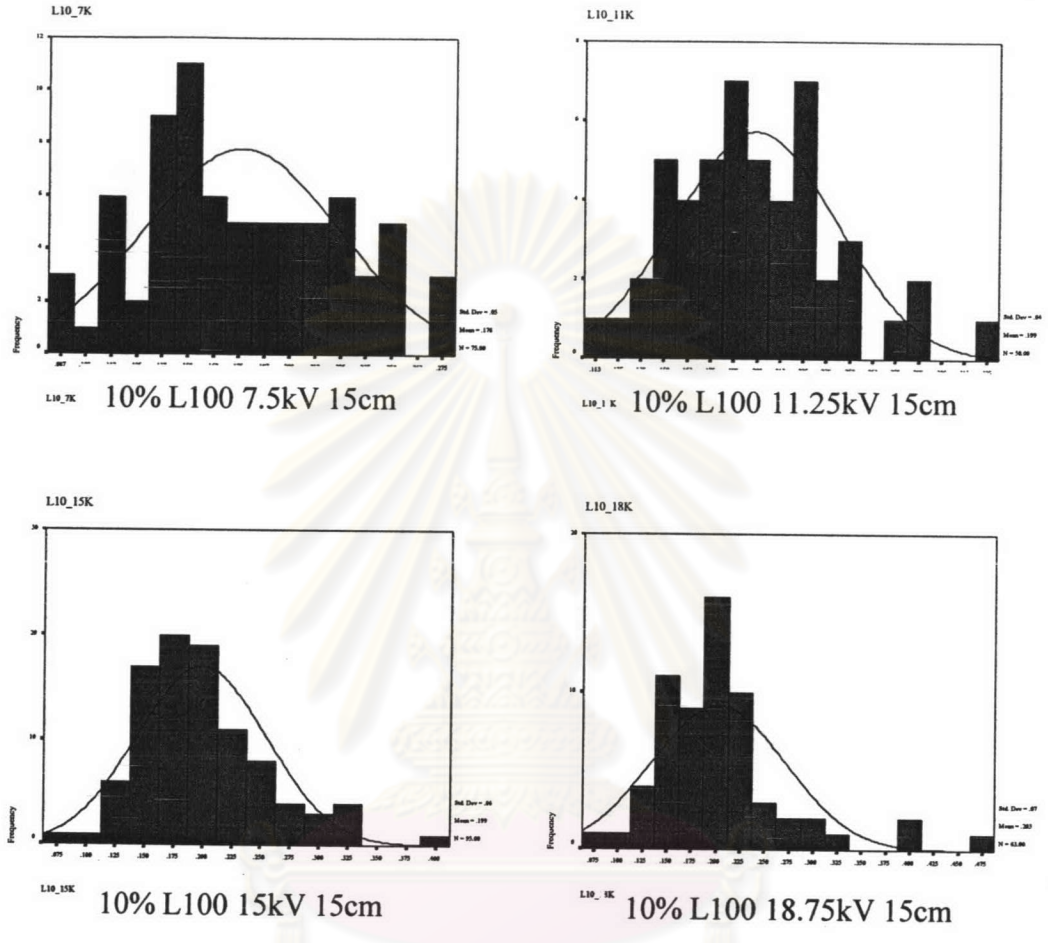


Figure 28 The histogram of Eudragit L100 in EtOH at 10%w/v 15 cm

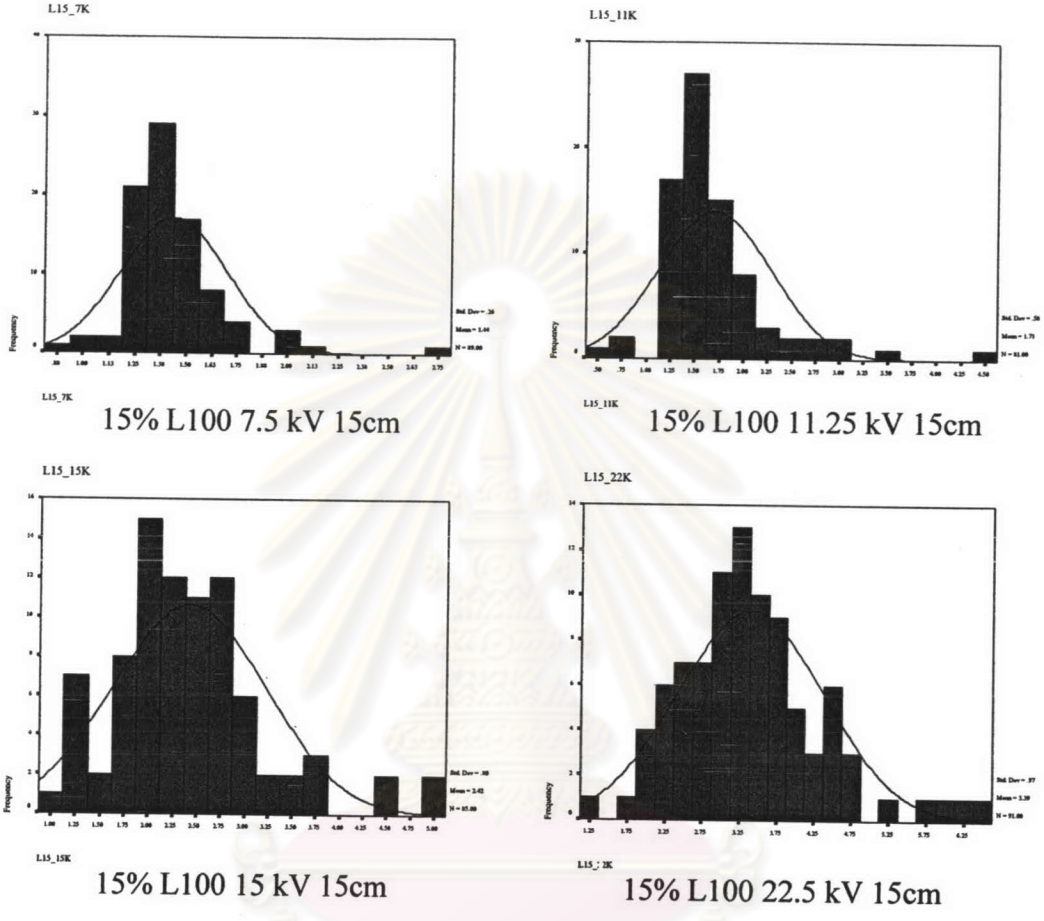


Figure 29 The histogram of Eudragit L100 in EtOH at 15%w/v 15 cm

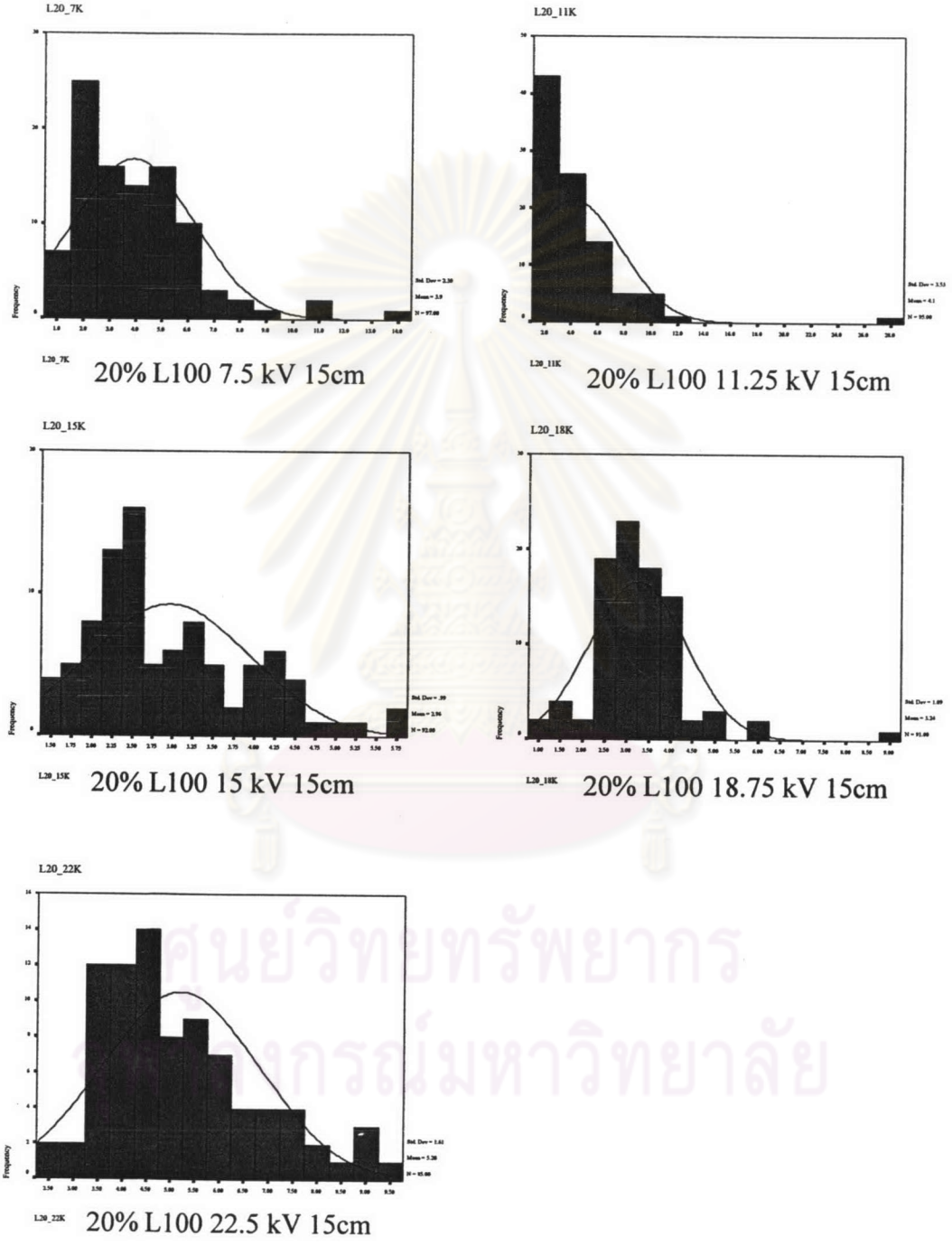


Figure 30 The histogram of Eudragit L100 in EtOH at 20%w/v 15 cm

References

1. Raleigh, L. *London, Edinburgh and Dublin Philosophical Magazine* 14 **(1882)**:184-186.
2. Formhals, A. "Process and Apparatus for Preparing Artificial Threads" US Patent **(1934)** 1,975,504.
4. Taylor, G. I. "Electrically Driven Jets" *Royal Society of London* A 313 **(1969)**: 453-475.
5. Baumgarten, P.K. "Electrostatic Spinning of Acrylic Microfibers" *Journal of Colloid and Interface Science* 36(1) **(1971)**: 71-79.
6. Fong, H.; Chun, I.; and Reneker, D. H. "Beaded Nanofibers Formed During Electrospinning" *Polymer* 40 **(1999)**: 4585-4592.
7. Deitzel, J. M.; Kleinmeyer, J.; Harris, D.; and Beck Tan, N. C. "The Effect of Processing Variables on the Morphology of Electrospun Nanofibers and Textiles" *Polymer* 42 **(2001)**: 261-272.
8. Doshi, J.; Reneker, D. H. "Electrospinning Process and Applications of Electrospun Fibers" *Journal of Electrostatics* 35 **(1995)**: 151-160.
9. Norris, I. D.; Shaker, M. M.; Ko, F. K.; and MacDiarmid, A. G. "Electrostatic Fabrication of Ultrafine Conducting Fibers: Polyaniline/Polyethylene Oxide Blends" *Synthetic Metals* 114 **(2000)**: 110-114.
10. Rutldge, G. C.; Shin, M. Y.; Warner, S. B.; Buer, A.; Grimler, M.; and Ugbolue, S. C. "A Fundamental Investigation of the Formation And Properties of Electrospun Fibers" *National Textile Center Annual Report: November 2000* M98-D01 **(2000)**.
11. Huang, Z. –M.; Zhang, Y. –Z.; Kotaki, M.; and Ramakrishna, S. " A Review on Polymer Nanofibers by Electrospinning and their Applications in Nanocomposites" *Composite Science and Technology* 63 **(2003)**: 2223-2253.
12. Reneker, D. H.; and Chun, I. "Nanometre Diameter Fibers of Polymer Produced by Electrospinning" *Nanotechnology* 7 **(1996)**: 216-223.
13. Fang, X.; Reneker, D. H. "DNA Fibers by Electrospinning" *Journal of Macromolecules Science Physics* B36 **(1997)**: 169-173.

14. Reneker, D. H.; Yarin, A. L.; Fong H.; and Koombhongse, S. "Bending Instability of Electrically Charged Liquid Jets of Polymer Solutions in Electrospinning" *Journal of Applied Physics* 87(9) **(2000)**: 4531-4547.

15. Shin, Y. M.; Hohman, M. M.; Brenner, M. P.; and Rutledge, G. C. "Experimental Characterization of Electrospinning: The Electrically Forces Jet and Instabilities" *Polymer* 42 **(2001)**: 9955-9967.

16. Zong, X.; Kim, K.; Fang, D.; Ran, S.; Hsiao, B. S.; and Chu, B. "Structure and Process Relationship of Electrospun Bioabsorbable Nanofiber membranes" *Polymer* 43 **(2002)**: 4403-4412.

17. Jeager, R.; Schönherr, H.; and Vancso, G. J. "Chain Packing in Electrospun Poly(ethylene oxide) Visualized by Atomic Force Microscopy" *Macromolecules* 29 **(1996)**: 7634-7636.

18. Bucko, C. J.; Chen, L. C.; Shen, Y.; and Martin, D. C. "Processing and Microstructural Characterization of Porous Biocompatible Protein Polymer Thin Films" *Polymer* 40 **(1999)**: 7397-7407.

19. Tsaia, P. P.; Schreuder, G. H.; Mello, C.; Sennett, M.; Gibson, P. "Different Electrostatic Methods for Making Electret Filters" Journal of Electrostatics 54 **(2002)**: 333-341.

20. Smith, D.; Reneker, D. H.; Schreuder, G. H.; Mello, C.; Sennett, M.; and Gibson, P. PCT/US00/27776, 2001.

21. Dzenis, Y. A.; and Reneker, D. H. "Delamination Resistant Composites Prepared by Small Diameter Fiber Reinforcement at Ply Interfaces" US Patent 6 265 333, 2001.

22. Doshi, J.; and Reneker, D. H. "Electrospinning Process and Applications of Electrospun Fibers" *Journal of Electrostatics* 35 (1995): 151-160.

23. Kenawy, E. R.; Bowlin, G. L.; Mansfield, K.; Layman, J.; Simpson, D. G.; Sander, E. H.; Wnek, G. E. "Release of Tetracycline Hydrochloride from Electrospun Poly(ethylene-co-vinylacetate), Poly(lactic acid), and a Blend" *Journal of Controlled Release* 81 **(2002)**: 57-64.

24. Zeng, J.; Xu, X.; Chen, X.; Liang, Q.; Bian, X.; Yang, L.; and Jing X "Biodegradable electrospun fibers for drug delivery " *Journal of Controlled Release* 92 **(2003)**: 227-231.

25. Ignatious, F.; and Baldoni, J. M. "Electrospun Pharmaceutical Compositions" WO 0154667 (2001)

27. Vasant, V. R.; and Mannfred, A. H. "Role of Polymer in drug delivery" *Drug Delivery Systems* 2 (2003): 64-65.

28. Shiraishi, S.; Imai, T.; and Otagiri, M. "Controlled Release of Indomethacin by Chitosan-Polyelectrolyte Complex: Optimization and In vivo/ In vitro Evaluation" *Journal of Controlled Release* 25 **(1993)**: 217-225.

29. British Pharmacopoeia, Volume 2, London: The Stationary Office, 1998.

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