REFERENCES

Adeyeye, C. M. , and Li, P. 1990. Diclofenac sodium. In K. Florey, A. A. Al-Badr, and T. J. Wozniak (eds.), **Analytical profiles of drug substances** (vol. 19). pp. 123-144. New York: Academic Press.

Agrawal, Y. K. , Upadhyay, V. P. ,and Menon, S. K. 1988. Spectrophotometric determination of diclofennac sodium. **Indian J.Pharm.Sci.** 50(1): 58-60.

Akbuga, J. 1991. Effect of microsphere size and formulation factors on drug release from controlled-release furosemide microspheres. **Drug Dev. Ind. Pharm.** 17(4): 593-607.

American Pharmaceutical Association. 1986. **Handbook of pharmaceutical excipients**. Washington, DC: The Pharmaceutical Press.

Asker, A. F. ,and Becker, C. H. 1966. Some spray-dried formulations of sulfaethylthiadiazole for prolonged release medication. **J. Pharm. Sci.** 55(1): 90-94.

Backensfeld, T. , Muller, B. W. , and Kolter, K. 1991. Interaction of NSA with cyclodextrins and hydroxypropylcyclodextrin derivatives. **Int. J. Pharm.** 74: 85-93.

Baker, R. 1987. **Controlled release of biologically active agents**. New York: John Willey & Son.

Baveja, S. K. , and Rao, K. V. R. 1986. Sustained release tablet formulation of cetperazine. **Int. J. Pharm.** 31: 169-174.

Benita, S. , Babay, D. , Hoffman, A. , and Donbrow, M. 1988. Relation between individual and ensemble release kinetics of indomethacin from microsperes. **Pharm. Res.** 5: 178-182.

_____. , and Donbrow, M. 1982. Release kinetics of Sparingly soluble drugs from ethylcellulose walled microcapsules: theophylline microcapsules. **J. Pharm. Pharmacol.** 34: 77-82.

Bianchini, R. , Bruni, G. , Gazzaniga, A. , and Vecchio, C. 1993. D-indobufen extended-release pellets prepared by coating with aqueous polymer dispersions. **Drug Dev. Ind. Pharm.** 19(16): 2021-2041.

Bodmeier, R. , and Chang, H. 1988. Preparation of biodegradable poly(+) lactide microparticles using a spray drying technique. **J. Pharm.Pharmacol.** 40: 754-757.

Brine, C. J. 1989. Controlled release pharmaceutical application of chitosan. In G. Skjak-Braek, T. Anthonsen, and P. Sandford(eds.), **Chitin and chitosan : sources, chemistry, biochemistry, physical properties and applications**, pp. 679-691. Belfast: The Universities Press.

Broadhead, J. , Rouan, S. K. E. , Hau, I. , and Rhodes, C. T. 1994. The effect of process an formulation variables on the properties of spray-dried β-galactosidase. **J. Pharm. Pharmacol.** 46: 458-467.

_____. , _____. , and Rhodes, C. T. 1992. The spray drying of pharmaceuticals. **Drug Dev. Ind. Pharm.** 18(11&12): 1169-1206.

Brzeski, M. M. 1989. Production and application of chitin and chitosan in Poland. In G. Skjak-Braek T. Anthonsens, and P. Sandford (eds.), **Chitin and chitosan : sources, chemistry, biochemistry, physical properties and applications**, pp. 161-169. Belfast: The Universities Press.

Budavari, S. , ed. 1989. **The merck index.** New Jersey: Merck.

Choulis, N. H. , and Papadopoulos, H. 1975. Timed-release tablets containing quinine sulfate. **J. Pharm. Sci.** 64: 1033-1035.

Chowdary, K. P. R. , and Ramesh, K. V. R. N. S. 1995. Controlled nifedipine release from microcapsules of its dispersions in PVP-MCC and HPC-MCC. **Drug Dev. Ind. Pharm.** 21(10): 1183-1192.

Conte, U. , Conti, B. , Guinchedi, P. , and Maggi, L. 1994. Spray dried polylactide microsphere preparation: influence of the technological preparation. **Drug Dev. Ind. Pharm.** 20(3): 235-258.

Corrigan, O. I. , and Holohan, E. M. 1984a. Amorphous spray-dried hydroflumethiazide polyvinylpyrrolidone system physicochemical properties. **J. Pharm. Pharmacol**. 36: 217-226.

_____. ,_____. , and Sabra, K. 1984b. Amorphous forms of thiazide diuretics prepared by spray drying. **Int. J. Pharm**. 18: 195-200.

Crosby, E. J. , and Marshall, W. R. 1958. Effects of drying conditions on the properties of spray dried particles. **Chem. Eng. Prog**. 54: 56-63.

Cusimano, A. G. , and Becker, C. H. 1968. Spray-congealed formulations of sulfaethylthiadiazole (SETD) and waxes for prolonged-release medication. **J. Pharm. Sci**. 57(7): 1104-1112.

Dangprasirt, P. , and Ritthidej, G. C. 1995. Development of diclofenac sodium controlled release solid dispersion by spray drying using optimization strategy I. powder formulation. **Drug Dev. Ind. Pharm**. 21(20): 2323-2337.

Deasy, P. B. 1984. Spray drying, spray congealing, spray embedding and spray polycondensation. In **Microencapsulation and related drug processes**, pp. 181-193. New York: Marcel Dekker.

De Barochez, B. H. , Lapeyre, F. , and Cuine, A. 1989. Oral sustained release dosage forms comparison between matrices and reservoir devices. **Drug Dev. Ind. Pharm**. 15(6&7): 1001-1020.

Donbrow, M. , and Friedman, M. 1974. Permeability of films of ethylcellulose and PEG (polyethylene glycol) to caffeine. **J. Pharm. Pharmacol**. 26: 148-150.

Fassihi, A. R. , and Parker, M. 1985. Controlled drug release from a compressed heterogeneous polymeric matrix : kinetics of release. In M. H. Rubinstein (ed.), **Controlled drug release** (vol.1). pp. 64-71. England.

Fessi, H. , Marty , J. P. , Puisi eux , F. , and Cartensen, J. T. 1982. Squre root of time dependence of matrix formulations with low drug content. **J. Pharm. Sci.** 71: 749-752.

Filar, L. J. , and Wirick, M. G. 1978. Bulk and solution properties of chitosan. In R. A. A. Muzzarelli, and E. R. Pariser (eds.), **Proc. 1st, Inter. Conf. on chitin/chitosan**, pp. 169-181. Boston: MIT SG 78-79.

FMC Corp. , 1983. Sustained release product informulation folder. Philadelphia : FMC. (Unpublished Manuscript)

Ford, J. L. , Rubinstein, M. H. , and Hogan, J. E. 1985a. Formulation of sustained release promethazine hydrochloride tablets using hydroxypropylmethylcellulose matrices. **Int. J. Pharm.** 24: 327-338.

_____. ,_____. ,_____. 1985b. Dissolution of a poorly water soluble drug, indomethacin, from HPMC controlled release tablets. **J.Pharm. Pharmacol.** 37: 33.

_____. ,_____. , _____. 1985c. Propranolol hydrochloride and aminophylline release from matrix tablets containing HPMC. **Int. J.Pharm.** 24: 339-350.

Foster, T. P. , and Leatherman, M. W. 1995. Powder characteris of proteins spray dried from different spray dryers. **Drug Dev. Ind. Pharm.** 21(15): 1705-1723.

Gilligan, C. A. , and Po, A. L. W. 1997. Factors affecting drug release from a pellet system coated with an aqueous colloidal dispersion. **Int. J.Pharm.** 73: 51-68.

Goodhart, F. W. , Harris, M. R. , Murthy, K. S. , and Nesbitt, R. U. 1984. An evaluation of aqueous film-forming dispersions for controlled release. **Pharm. Technol.** 8(4): 64-71.

Gordon, R. E. , Rosanke, T. W. , Fonner, D. E. , Anderson, N. R. , and Banker, G. S. 1990. Granulation technology and tablet characterization. In H. A. Lieberman, L. Lachman, and J. B. Schwaetz (eds.), **Pharmaceutical dosage forms : tablets** (3 vols. 2nd. ed.), New York: Marcel Dekker.

Grass IV, G. M. , and Robinson, J. R. 1990. Sustained-and controlled-release drug delivery systems. In G. S. Banker, and C. T. Rhodes (eds.), **Modern pharmaceutics** (2nd. ed.), New York: Marcel Dekker.

Greminger, G. K. , and Krumel, K. L. 1980. **Handbook of water-soluble gums and resins**. New York: McGraw-Hill Book.

Hamid, I. S. , and Becker, C. H. 1970. Release study of sulfaethylthiadiazole (SETD) from a tablet dosage form prepared from spray-congealed formulations of SETD and wax. **J. Pharm. Sci.** 59(4): 511-514.

Harris, M. R. ,and Ghebre-Sellassie, I. 1989. Aqueous polymeric coating for modified-release pellets. In J. W. McGinity (ed.), **Aqueous polymeric coating for pharmaceutical dosage forms**, pp. 63-79. New York: Marcel Dekker.

Higuchi, T. 1961. Rate of release of medicaments from ointment bases containing drugs in suspension. **J. Pharm. Sci.** 50: 874.

_____. 1963. Mechanism of sustained-action medication : theoretical analysis of rate of release of solid drugs dispersed in solid matrices. **J. Pharm. Sci.** 52: 1145-1149.

Hogan, J. E. 1989. Hydroxypropylmethylcellulose sustained release technology. **Drug Dev. Ind. Pharm.** 15(6&7): 975-999.

John, P. M. , and Becker, C. H. 1968. Surfactant effects on spray-congealed formulations of sulfaethylthiadiazole-wax. **J. Pharm. Sci.** 57(4): 584-589.

Jonkman, J. H. G. , Berg, W. C. , and De Zeeuw, R. A. 1983. Dissolution models involving a pH change : their correlation with absorption of theophylline from sustained-release tablets. In F. W. H. M. Merkus, and L. Hendeles (eds.), **Sustained release theophylline : a biopharmaceutical challenge to a clinical need**, pp. 79-103. Amsterdam: Excerpta Media.

Kawashima, Y. , et al. 1989. Preparation of controlled-release microspheres of ibuprofen with acrylic polymers by a novel quasi-emulsion solvent diffusion method. **J. Pharm. Sci.** 78(1): 68-72.

_____., Lin, S. Y. , and Takenaka, H. 1983. Polymorphism and drug release behavior of spray drie microcapsules of sulfamethoxazole with polysaccharide gum and colloidal silica. **Drug Dev. Ind.Pharm.** 9(8): 1445-1463.

Kawashima, Y. , Lin, S. Y. , and Takenaka, H. , Handa, T. , and Ando, Y. 1985. Novel method for the preparation of controlled-release theophylline granules coated with a polyelectrolyte complex of sodium polyphosphate-chitosan. **J. Pharm. Sci.** 74: 264-268.

_____. , _____. , _____. , Kasai, A. , and Hadeo, T. 1985. Preparation of a prolonged release tablet of aspirin with chitosan. **Chem. Pharm. Bull.** 33: 2107-2113.

_____. , _____. , Ueda, M. , Takenaka, H. , and Ando, Y. 1983. Direct preparation of solid particulates of aminopyrine-barbital complex (pyrabital) from droplets by a spray-drying technique. **J. Pharm. Sci.** 72(5): 514-518.

_____. , Matsuda, K. , and Takenaka, H. 1972. Physicochemical properties of spray-dried agglomerated particles of salicylic acid and sodium salicylate. **J. Pharm. Pharmacol.** 24: 505-512.

_____. , Niwa, T. , Takeuchi, H. , Hino, T. , and Itoh, Y. 1992. Hollow microspheres for use as a floating controlled drug delivery system in the stomach. **J. Pharm. Sci.** 81(2): 135-140.

_____. , Saito, M. , and Takenaka, H. 1975. Improvement of solubility and dissolution rate of poorly water soluble salicylic acid by a spray drying technique. **J. Pharm. Pharmacol.** 27: 1-5.

_____. , and Takenaka, H. 1974. Reduced acid-neutralizing velocity of spary-dried agglomerated magnesium carbonate. **J. Pharm. Sci.** 63(10): 1546-1551.

Kohri, N. , Miyazaki, K. , Aita, T. , Shimono, H. , Nomura, A. , and Yasuda, H. 1987. Release characteristics of nifedipine sustained release granules in vitro and in healthy subjects. **Chem. Pharm. Bull.** 35(6): 2504-2509.

Kondo, A. 1979. Microencapsulation by spray drying process. In J. W. V. Valkenburg (ed.), **Microcapsule processing and technology,** pp. 154-165. New York: Marcel Dekker.

Kornblum, S. S. 1969. Sustained-action tablets prepared by employing a spray drying technique for granulation. **J. Pharm. Sci.** 58(1):125-127.

Kydanieus, A. F. 1980a. **Controlled release technologies: method, theory, and applications** (vol. 1). Florida: CRC Press.

_____. 1980b. **Controlled release technologies: method, theory, and applications** (vol. 2). Florida: CRC Press.

Labrude, P. , Rasolomanana, M. , Vigneron, C. , Thirion, C. , and Chaillot, B. 1989. Protective effect of sucrose on spray drying of oxyhemoglobin. **J. Pharm. Sci.** 78: 223-229.

Lantz, R. J. , Jr. , and Schwartz, J. B. 1990. Mixing. In H. A. Lieberman, L. Lachman, J. B. Schwartz (eds.), **Pharmaceutical Dosage forms, tablets forms** (2 vols. , 2nd. cd.). pp. 32-40. New York: Marcel Dekker.

Lapidus, H. , and Lordi, N. G. 1966. Some factors affecting release of a water-soluble drug from a compressed hydrophilic matrix. **J. Pharm. Sci.** 55(8): 840-843.

Lapidus, H. , and Lordi, N. G. 1968. Drug release from compressed hydrophilic matrices. **J. Pharm. Sci.** 57(8): 1292-1301.

Lee, V. H. , and Robinson, J. R. 1978. Methods to achieve sustained drug delivery. In J. R. Robinson (ed.), **Sustained and controlled release drug delivery systems**, pp. 71-121. New York: Marcel Dekker.

Lin, S. Y. , and Kao, Y. H. 1989. Solid particulates of drug-beta-cyclodextrin inclusion complexes directly prepared by a spray drying technique. **Int. J. Pharm.** 56: 249-259.

_____. , _____. 1991. Tablet formulation study of spray-dried sodium diclofenac enteric-coated microcapsules. **Pharm. Res.** 8(7): 919-924.

Lund, W. , ed. 1994. **The Pharmaceutical Codex** (21th. ed.). London: The Pharmaceutical Press.

Luzzi, L. A. , Zoglio, M. A. , and Maulding, H. V. 1970. Preparation and evaluation of the prolonged release properties of nylon microcapsules. **J. Pharm. Sci.** 59(3): 338-341.

Maitani, Y. , Nakagaki, M. , and Nagai, T. 1991. Determination of the acid dissociation constants in ethanol-water mixtures and partition coefficients for diclofenac. **Int. J. Pharm.** 74: 105-114.

Masters, K. 1979. **Spray drying handbook** (3rd. ed.). New York: John Wiley & Sons.

Matsuda, Y. , Otsuka, M. , Onoe, M. , and Tatsumi, E. 1991. Amorphism and physicochemical stability of spray-dried frusemide. **J. Pharm.Pharmacol**. 44: 627-633.

McKetta, J. , ed. 1983. **Encyclopedia of chemical processing and design**. New York: Marcel Dekker.

Miyazaki, S. , Ishii, K. , and Nadai, T. 1981. Use of chitin and chitosan as drug carriers. **Chem. Pharm. Bull**. 29: 3067-3069.

Moffat, A. C. , Jackson, J. V. , Moss, M. S. , and Widdop, B. , eds. 1986. **Clarke's solation and identification of drugs** (2nd. ed.). pp. 533- 534. London: The Pharmaceutical Press.

Muzzarelli, R. A. A. 1977. **Chitin**. Oxford: Pergamon Press.

Newton, J. M. 1966. Spray drying and its application in pharmaceuticals. **Manu. Chem. and Aerosol News** 33(4): 33-36, 55.

Nielson, F. 1982. Spray drying pharmaceuticals. **Manu. Chem**. 53(7): 38-41.

Nigalaye, A. G. , Adusumilli, P. , and Bolton, S. 1990. Investigation of prolonged drug release from matrix formulations of chitosan. **Drug Dev. Ind. Pharm**. 16(3): 449-467.

Onions, A. 1986. Films from water-based colloidal dispersions. **Manu. Chem.** 57: 56-59, 66-67.

Pagay, S. N. 1988. Use of buffers in matrix capsule formulations. **Drug Dev. Ind. Pharm**. 14(7): 875-894.

Palmieri, G. F. , Wehrle, P. , and Stamm, A. 1994. Evaluation of spray-drying as a method to prepare microparticles for controlled drug release. **Drug Dev. Ind. Pharm**. 20(18): 2859-2879.

Peppas, N. A. 1985. Analysis of Fickian and non-Fickian drug release from polymers. **Pharm. Acta. Helv**. 60: 110-111.

Pillai, J. C. , Babar, A. , and Plakogiannis, F. M. 1988. Polymers in cosmetic and pharmaceutical industries. **Pharm. Acta. Helv.** 63: 46-53.

Raff, A. M. , Robinson, M. J. , and Svedres, E. V. 1961. Spray drying of tablet granulation I. **J. Pharm. Sci.** 50(1): 76-79

Reynolds, E. F. , Parfitt, K. , Parsons, A. V. , and Sweetman, S. C. , eds. 1989. **Martindale : the extra pharmacopoeia** (29th. ed.). pp. 12-13. London: The Pharmaceutical Press.

Rinando, M. , and Domard, A. 1989. Solution properties of chitosan. In G. Skjak-Braek, T. Anthonsen, and P. Sandford (eds.), **Chitin and Chitosan : sources, chemistry, biochemistry, physical properties and applications**, pp. 71-86. Belfast: The Universities Press.

Ritger, P. L. , and Peppas, N. A. 1987a. A simple equation for description of solute release I. Fickian and non-Fickian release from non-swellable device in the form of slabs, spheres, cylinders or discs. **J. Controlled Release** 5: 23-36.

_____. ,_____. 1987b. A simple equation for description of solute release II. Fickian and anomalous release from swellable devices. **J. Controlled Release** 5: 37-42.

Sa, B. , Bandayyopadhyay, A. K. , and Gupta, B. K. 1990. Development and in vitro evaluation of ethylcellulose micropellets as a controlled release dosage form theophylline. **Drug Dev. Ind. Pharm.** 16: 1153-1169.

Sarisuta, N. , and Sirithunyalug, J. 1988. Release rate of indomethacin from coated granules. **Drug Dev. Ind. Pharm.** 14(5): 683-687

Sawayanagi, Y. 1982a. Directly compressed tablets containing chitin and chitosan in addition to mannitol. **Chem. Pharm. Bull.** 30: 4216-4218.

_____. 1982b. Enhancement of dissolution properties of griseofulvin from ground mixtures with chitin and chitosan. **Chem. Pharm. Bull.** 30: 4464-4467.

_____. 1982c. Use of chitosan for sustained-release preparations of water soluble drugs. **Chem. Pharm. Bull.** 30:4213-4215.

Sawayanagi, Y. 1983a. Enhancement of dissolution properties of prednisolone from ground mixtures with chitin and chitosan. **Chem. Pharm. Bull.** 31: 2507-2509.

_____. 1983b. Dissolution properties and bioavailability of phenytoin from ground mixtures with chitin and chitosan. **Chem. Pharm. Bull.** 31: 2064-2068.

_____. , Numbu, N. , and Nagai, T. 1982. Directly compressed tablets containing chitin and chitosan in addition to lactose or potato starch. **Chem. Pharm. Bull.** 30: 2935-2940.

Seager, H. 1977. Spray-coating bulk drugs aid dosage form production. **Manu. Chem. and Aerosol News** 48(4): 25-35.

Schwartz, J. B. , Simonelli, A. P. , and Higuchi, W. I. 1968. Drug release from wax matrices I, analysis of data with first-order kinetics and with diffusion-controlled model. **J. Pharm. Sci.** 57:274-277.

Sheu, M. T. , Chou, H. L. , Kao, C. C. , Liu, C. H. , and Sokoloski, T. D. 1992. Dissolution of diclofenac sodium from matrix tablets. **Int. J. Pharm.** 85: 57-63.

Steuernagel, C. R. 1989. Latex emulsion for controlled drug delivery. In J. W. McGinity (ed.), **Aqueous polymeric coating for pharmaceutical dosage forms**, pp. 1-61. New York: Marcel Dekker.

Takenaka, H. , Kawashima, Y. , and Lin, S. Y. 1980. Preparation of enteric coated microcapsules for tableting by spray-drying technique and in vitro simulation of drug release from the tablet in GI tract. **J. Pharm. Sci.** 69(12): 1388-1392

_____. ,_____. ,_____. 1981. Polymorphism of spray-dried microencapsulated sulfamethoxazole with cellulose acetate phthalate and colloidal silica, monmorillonite or talc. **J. Pharm. Sci.** 70(11): 1256-1260.

Takeuchi, H. , Handa, T. , and Kawashima, Y. 1987. Spherical solid dispersion containing amorphous tolbutamide embedded in enteric coating polymers or colloidal silica prepared by spray-drying technique. **Chem. Pharm. Bull.** 35(9): 3800-3806.

Takeuchi, H. , Handa, T. , and Kawashima, Y. 1989. Controlled release theophylline tablet with acrylic polymers prepared by spray drying-technique in aqueous system. **Drug Dev. Ind. Pharm.** 15(12): 1999-2016.

Tapia, C. , Buckton, G. , and Newton, J. M. 1993. Factors influencing the mechanism of release from sustained release matrix pellets, produced by extrusion/spheronisation. **Int. J. Pharm.** 92: 211-218.

The United States Pharmacopeial Convention. 1995. **The United States Pharmacopeia** (USP) (23th. rev. ed.). Massachusetts: n.p.

Tsuda, Y. , Ischida, M. , Suzuki, E. , and Sekiguchi, K. 1988. Spray drying of griseofulvin solution forming its solvate. **Chem. Pharm. Bull.** 36 (6):2193-2196.

Upadrashta, S. M. Katikaneni, P. R. , Hileman, G. A. , and Keshary, P. R. 1993. Direct compression controlled release tablets using ethylcellulose matrices. **Drug Dev. Ind. Pharm.** 19(4): 449-460.

Venktaram, S. , Khohlokwane, M. , and Wallis, S. H. 1995. Differential scanning calorimetry as a quick scanning technique for solid state stability studies. **Drug Dev. Ind. Pharm.** 21(7): 847-855.

Vipaluk Patomchaiviwat. 1993. **Effects of processing variables of spray drying technique on physical properties of controlled release on physical properties of controlled release theophylline matrices.** Master's Thesis, Chulalongkorn University.

Voellymy, C. , Speiser, P. , and Soliva, M. J. 1977. Microencapsulation of phenobarbital by spray polycondensation. **J. Pharm. Sci.** 66(5): 631-634.

Wagner, J. G. 1969. Interpretation of percent dissolved-time plots derived from in vitro testing of conventional tablets and capsules. **J. Pharm. Sci.** 58(10): 1253-1257.

Wan, L. S. C. , Heng, P. W. S, and Chia, C. G. H. 1990. Influence of operational and formulation factors on spray dried microcapsules. **JSPS-NUS Seminar on "Recent developments in pharmaceutical technology"**, pp. 190-206. Japan: Chiba.

Wan, L. S. C. , Heng, P. W. S, and Chia, C. G. H. 1991. Preparation of coated particles using a spray drying process with an aqueous system. **Drug Dev. Ind. Pharm.** 77:183-191.

_____. ,_____. ,_____. 1992. Spary drying as a process for microencapsulation and the effect of different coating polymers. **Drug Dev. Ind. Pharm.** 18(9): 997-1011.

_____. ,_____. , and Wong, L. F. 1990. Effect of hydroxypropylmethylcellulose on drug release from a matrix system. **JSPS-NUS Seminar on "Recent developments in pharmaceutical technology"**, pp. 35-56. Japan: Chiba.

Wilder, Ph. V. , Detaevernier, M. R. , and Michotte, Y. 1991. In vitro dissolution of two oral controlled release preparations of diclofenad sodium. **Drug Dev. Ind. Pharm.** 17(1): 141-148.

Wilson, C. G. , and Washington, N. 1989. **Physiological pharmaceutics; biological barriers to drug absorption.** Chichester: Ellis Horwood.

APPENDICES

Appendix A

Calibration Curve

The concentration versus absorbance of diclofenac sodium in 0.1 N. HCI acid at 275 mm. and in phosphate buffer pH 6.8 at 277 mm. were presented in Tables 29 and 30, showed a linear relationship with the correlation coefficient = 0.9999.

Table 29 Absorbance of diclofenac sodium in 0.1 N.HCI acid determined at 275nm..

Concentration (μg/ml)	Absorbance
0	0.000
5	0.140
10	0.274
15	0.411
20	0.547
25	0.685

Table 30 Absorbance of diclofenac sodium in phosphate buffer pH 6.8 determined at 277 nm..

Concentration(μg/ml)	Absorbance
0.0000	0.000
0.0025	0.081
0.0050	0.162
0.0075	0.244
0.0100	0.324
0.0125	0.405

Appendix B

Percentage of Drug Release, Release Rate

Release Rate Against Amount and Reciprocal of Amount

Table 31 Percentage of diclofenac sodium release from blank capsules and commercial products in pH change method.

Formulation	Time (hour)	√Time	Mean*	SD	Log%Drug Remained
Blank	1	1	0.18	0.19	2.00
	2	1.41	0.71	0.21	2.00
	3	1.73	76.11	2.41	1.38
	4	2	89.77	0.82	1.01
	6	2.45	94.41	1.30	0.75
	9	3	96.04	1.82	0.60
	12	3.46	97.67	0.74	0.37
	15	3.87	98.46	0.81	0.19
	18	4.24	98.98	0.76	0.01
	24	4.90	100.03	0.13	-

Formulation	Time (hour)	√Time	Mean*	SD	Log%Drug Remained
Voltaren SR	1	1	0.00	0.00	2.00
	2	1.41	0.00	0.00	2.00
	3	1.73	4.01	0.29	1.98
	4	2	10.41	0.52	1.95
	6	2.45	24.55	0.00	1.88
	9	3	42.24	2.58	1.76
	12	3.46	52.05	2.22	1.68
	15	3.87	59.40	2.52	1.61
	18	4.24	64.64	2.71	1.55
	24	4.90	73.88	1.88	1.42

*Mean of three determinations (%)

Table 32 Percentage of diclofenac sodium release from microparticles containing hydroxypropylmethylcellulose in pH change method.

Formulation	HPMC:DS	Time (hour)	√Time	Mean*	SD	Log%Drug Remained
1	1:2	1	1	0.99	0.05	2.00
		2	1.41	2.09	0.26	1.99
		3	1.73	9.56	1.02	1.96
		4	2	12.42	0.22	1.94
		6	2.45	24.96	0.56	1.88
		9	3	48.24	4.41	1.71
		12	3.46	66.82	4.06	1.52
		15	3.87	77.02	2.36	1.36
		18	4.24	89.81	3.82	1.01
		24	4.90	95.56	0.41	0.65
2	1:4	1	1	0.98	0.31	2.00
		2	1.41	1.77	0.16	1.99
		3	1.73	11.49	0.41	1.95
		4	2	16.90	1.27	1.92
		6	2.45	26.95	1.08	1.86
		9	3	46.44	4.43	1.73
		12	3.46	67.21	3.41	1.52
		15	3.87	80.69	5.48	1.29
		18	4.24	93.72	1.89	0.80
		24	4.90	97.63	0.73	0.38

Formulation	HPMC:DS	Time (hour)	√Time	Mean*	SD	Log%Drug Remained
3	1:6	1	1	0.92	0.04	2.00
		2	1.41	1.43	0.08	1.99
		3	1.73	15.70	1.35	1.93
		4	2	24.36	0.72	1.88
		6	2.45	38.47	2.45	1.79
		9	3	65.75	6.28	1.54
		12	3.46	79.65	4.48	1.31
		15	3.87	84.80	2.15	1.18
		18	4.24	94.12	1.13	0.77
		24	4.90	97.19	1.04	0.45

*Mean of three determinations (%)

Table 33 Percentage of diclofenac sodium release from microparticles containing ethylcellulose in pH change method

Formulation	EC:DS	Time (hour)	√Time	Mean*	SD	Log%Drug Remained
4	1:1	1	1	0.70	0.21	2.00
		2	1.41	1.77	0.09	1.99
		3	1.73	6.79	0.30	1.97
		4	2	9.19	0.20	1.96
		6	2.45	17.81	0.12	1.92
		9	3	25.62	0.76	1.87
		12	3.46	32.56	1.21	1.83
		15	3.87	35.41	0.69	1.81
		18	4.24	37.55	1.27	1.80
		24	4.90	43.59	0.65	1.75
5	1:2	1	1	0.47	0.14	2.00
		2	1.41	1.71	0.26	1.99
		3	1.73	8.89	0.49	1.96
		4	2	12.85	0.88	1.94
		6	2.45	23.25	1.08	1.89
		9	3	41.28	0.94	1.77
		12	3.46	48.00	1.44	1.72
		15	3.87	51.75	0.82	1.68
		18	4.24	57.38	1.14	1.63
		24	4.90	63.48	1.16	1.56

Formulation	EC:DS	Time (hour)	√Time	Mean*	SD	Log%Drug Remained
6	1:4	1	1	0.82	0.11	2.00
		2	1.41	1.66	0.33	1.99
		3	1.73	8.92	1.81	1.96
		4	2	20.26	0.76	1.90
		6	2.45	35.56	5.18	1.81
		9	3	52.52	3.55	1.68
		12	3.46	66.98	2.62	1.52
		15	3.87	79.33	0.95	1.32
		18	4.24	89.47	1.32	1.02
		24	4.90	94.72	1.66	0.72
7	1:6	1	1	0.76	0.02	2.00
		2	1.41	1.73	0.07	1.99
		3	1.73	14.86	0.15	1.93
		4	2	24.22	1.37	1.88
		6	2.45	36.28	0.66	1.80
		9	3	55.48	3.28	1.65
		12	3.46	69.68	1.04	1.48
		15	3.87	80.28	1.24	1.30
		18	4.24	90.90	0.79	0.96
		24	4.90	94.87	1.46	0.71

*Mean of three determinations (%)

Table 34 Percentage of diclofenac sodium release from microparticles containing chitosan in pH change method

Formulation	CT:DS	Time (hour)	√Time	Mean*	SD	Log%Drug Remained
8	1:2	1	1	0.80	0.07	2.00
		2	1.41	0.85	0.02	2.00
		3	1.73	55.38	4.82	1.65
		4	2	59.73	4.19	1.61
		6	2.45	61.37	4.21	1.59
		9	3	63.26	4.10	1.57
		12	3.46	65.18	3.88	1.54
		15	3.87	67.43	3.70	1.51
		18	4.24	67.97	3.35	1.51
		24	4.90	7..63	3.15	1.45
9	1:4	1	1	1.18	0.06	2.00
		2	1.41	1.46	0.04	1.99
		3	1.73	81.47	0.96	1.27
		4	2	82.61	1.63	1.24
		6	2.45	83.52	1.08	1.22
		9	3	84.41	1.26	1.19
		12	3.46	84.45	0.87	1.19
		15	3.87	84.47	0.38	1.19
		18	4.24	84.87	0.55	1.18
		24	4.90	84.87	0.81	1.18

Formulation	CT:DS	Time (hour)	√Time	Mean*	SD	Log%Drug Remained
10	1:6	1	1	1.63	0.05	1.99
		2	1.41	1.96	0.10	1.99
		3	1.73	84.76	1.23	1.18
		4	2	85.83	1.06	1.15
		6	2.45	85.94	0.42	1.15
		9	3	86.09	0.46	1.14
		12	3.46	86.43	0.62	1.13
		15	3.87	86.59	0.75	1.13
		18	4.24	86.81	1.24	1.12
		24	4.90	87.05	0.75	1.11

*Mean of three determinations (%)

Table 35 Percentage of diclofenac sodium release from microparticles containing hydroxypropylmethylcellulose and ethylcellulose in pH change method .

Formulation	(HPMC:EC) :DS	Time (hour)	√Time	Mean*	SD	Log%Drug Remained
11	(1:1):4	1	1	0.72	0.11	2.00
		2	1.41	1.56	0.21	1.99
		3	1.73	7.27	0.60	1.97
		4	2	12.42	0.53	1.94
		6	2.45	18.45	0.75	1.91
		9	3	27.30	0.33	1.86
		12	3.46	35.32	2.14	1.81
		15	3.87	40.66	3.30	1.77
		18	4.24	45.78	2.92	1.73
		24	4.90	54.08	3.06	1.66
12	(1:1):8	1	1	0.76	0.02	2.00
		2	1.41	1.87	0.06	1.99
		3	1.73	9.63	0.46	1.96
		4	2	13.77	0.21	1.94
		6	2.45	19.32	0.95	1.91
		9	3	28.08	0.85	1.86
		12	3.46	34.25	3.60	1.82
		15	3.87	40.01	3.24	1.78
		18	4.24	49.80	1.40	1.70
		24	4.90	59.75	2.10	1.61
13	(1:1):12	1	1	0.95	0.07	2.00
		2	1.41	2.51	0.46	1.99
		3	1.73	10.01	0.68	1.95
		4	2	16.41	0.68	1.92
		6	2.45	26.05	1.69	1.87
		9	3	41.56	0.67	1.77
		12	3.46	54.83	1.53	1.66
		15	3.87	63.46	2.49	1.56
		18	4.24	69.91	2.62	1.48
		24	4.90	78.60	2.28	1.33

Formulation	(HPMC:EC) :DS	Time (hour)	√Time	Mean*	SD	Log%Drug Remained
14	(1.5:1):12	1	1	0.95	0.02	2.00
		2	1.41	1.58	0.05	1.99
		3	1.73	9.61	0.38	1.96
		4	2	16.04	0.44	1.92
		6	2.45	31.76	2.06	1.83
		9	3	62.24	3.36	1.58
		12	3.46	74.68	1.72	1.40
		15	3.87	80.40	1.04	1.29
		18	4.24	82.59	1.00	1.24
		24	4.90	86.99	0.78	1.11
15	(2:1):12	1	1	052	0.10	2.00
		2	1.41	2.05	0.38	1.99
		3	1.73	14.37	0.45	1.93
		4	2	26.45	0.73	1.87
		6	2.45	40.69	1.47	1.77
		9	3	4.46	3.38	1.70
		12	3.46	60.98	1.82	1.59
		15	3.87	70.00	1.62	1.48
		18	4.24	77.96	1.95	1.34
		24	4.90	82.98	3.28	1.23
16	(1:2):12	1	1	0.86	0.05	2.00
		2	1.41	2.10	0.12	1.99
		3	1.73	7.37	0.37	1.97
		4	2	11.39	0.26	1.95
		6	2.45	17.89	0.21	1.91
		9	3	26.43	0.53	1.87
		12	3.46	36.98	4.57	1.80
		15	3.87	45.89	1.84	1.73
		18	4.24	58.61	5.13	1.62
		24	4.90	77.97	1.71	1.34

*Mean of three determinations (%)

Table 36 Percentage of diclofenac sodium release from microparticles containing hydroxypropylmethylcellulose and chitosan in pH change method.

Formulation	(HPMC:CT) :DS	Time (hour)	√Time	Mean*	SD	Log%Drug Remained
17	(1:1):4	1	1	0.85	0.04	2.00
		2	1.41	0.94	0.05	2.00
		3	1.73	56.34	1.64	1.64
		4	2	63.26	0.84	1.57
		6	2.45	65.38	0.16	1.54
		9	3	67.63	0.07	1.51
		12	3.46	69.34	0.15	1.49
		15	3.87	71.21	1.15	1.46
		18	4.24	71.58	1.16	1.45
		24	4.90	72.56	0.82	1.44
18	(1:1):8	1	1	0.91	0.06	2.00
		2	1.41	0.92	0.04	2.00
		3	1.73	59.93	1.95	1.60
		4	2	68.18	1.66	1.50
		6	2.45	68.90	1.51	1.49
		9	3	69.45	1.68	1.49
		12	3.46	70.30	1.54	1.47
		15	3.87	76.17	3.19	1.38
		18	4.24	77.81	3.28	1.35
		24	4.90	79.47	2.96	1.31
19	(1:1):12	1	1	0.80	0.07	2.00
		2	1.41	1.05	0.09	2.00
		3	1.73	63.42	0.75	1.56
		4	2	70.12	0.71	1.48
		6	2.45	73.76	0.40	1.42
		9	3	79.02	0.72	1.32
		12	3.46	80.25	0.60	1.30
		15	3.87	80.83	0.46	1.28
		18	4.24	82.42	0.15	1.25
		24	4.90	82.50	0.09	1.24

Formulation	(HPMC:CT) :DS	Time (hour)	√Time	Mean*	SD	Log%Drug Remained
20	(2:1):12	1	1	0.68	0.04	2.00
		2	1.41	1.03	0.02	2.00
		3	1.73	72.47	0.94	1.44
		4	2	75.25	1.80	1.39
		6	2.45	77.70	2.00	1.35
		9	3	80.99	2.06	1.28
		12	3.46	83.05	1.71	1.23
		15	3.87	84.73	0.98	1.18
		18	4.24	85.14	0.49	1.17
		24	4.90	85.65	0.73	1.16
21	(1:2):12	1	1	0.95	0.09	2.00
		2	1.41	1.07	0.08	2.00
		3	1.73	77.87	2.01	1.35
		4	2	80.10	0.31	1.30
		6	2.45	81.30	0.58	1.27
		9	3	82.65	0.81	1.24
		12	3.46	83.30	0.57	1.22
		15	3.87	84.86	0.62	1.18
		18	4.24	85.92	0.39	1.15
		24	4.90	87.33	0.95	1.10

*Mean of three determinations (%)

Table 37 The release rate of blank diclofenac sodium and Voltaren SR in pH change method.

Mean Time	Release Rate (%/hour)	
	Blank	Voltaren SR
0.5	0.18	0.00
1.5	0.54	0.00
2.5	75.40	4.01
3.5	13.66	6.40
5	2.32	7.07
7.5	0.55	5.90
10.5	0.54	3.27
13.5	0.27	2.45
16.5	0.17	1.75
21	0.18	1.54

Table 38 The release rate of diclofenac sodium from Formulations 1-3 in pH change method.

Mean Time	Release Rate (%/hour)		
	Formulation 1	Formulation 2	Formulation 3
0.5	0.99	0.98	0.92
1.5	1.11	0.79	0.52
2.5	7.47	9.72	14.27
3.5	2.86	5.41	8.66
5	6.27	5.02	7.06
7.5	7.76	6.50	9.10
10.5	6.19	6.92	4.63
13.5	3.40	4.49	1.72
16.5	4.27	4.34	3.11
21	0.96	0.65	0.51

Table 39 The release rate of diclofenac sodium from Formulations 4-7 in pH change method .

Mean Time	Release Rate (%/hour)			
	Formulation 4	Formulation 5	Formulation 6	Formulation 7
0.5	0.70	0.47	0.82	0.76
1.5	1.07	1.23	0.84	0.97
2.5	5.02	7.18	7.26	13.13
3.5	2.40	3.96	11.34	9.36
5	4.31	5.20	7.65	6.03
7.5	2.60	6.01	5.65	6.40
10.5	2.31	2.24	4.82	7.40
13.5	0.95	1.25	4.12	3.53
16.5	0.71	1.87	3.38	3.54
21	1.01	1.02	0.88	0.66

Table 40 The release rate of diclofenac sodium from Formulations 8-10 in pH change method .

Mean Time	Release Rate (%/hour)		
	Formulation 8	Formulation 9	Formulation 10
0.5	0.80	1.18	1.63
1.5	0.05	0.28	0.33
2.5	54.52	80.01	82.80
3.5	4.36	1.14	1.07
5	0.82	0.46	0.06
7.5	0.63	0.30	0.05
10.5	0.64	0.01	0.11
13.5	0.75	0.01	0.05
16.5	0.18	0.13	0.07
21	0.61	0.00	0.04

Table 41 The release rate of diclofenac sodium from Formulations 11-16 in pH change method.

Mean Time	Release Rate (%/hour)					
	Formulation 11	Formulation 12	Formulation 13	Formulation 14	Formulation 15	Formulation 16
0.5	0.72	0.76	0.95	0.52	0.95	0.86
1.5	0.84	1.11	1.56	1.53	0.63	1.24
2.5	5.71	7.77	7.50	9.32	8.03	5.27
3.5	5.16	4.14	6.39	5.08	6.43	4.02
5	3.02	2.78	4.82	7.12	7.86	3.25
7.5	2.95	2.92	5.17	2.92	10.16	2.85
10.5	2.67	2.06	4.42	3.84	4.15	3.52
13.5	1.78	1.92	2.88	3.01	1.91	2.97
16.5	1.71	3.26	2.15	2.66	0.73	4.24
21	1.38	1.66	1.45	0.84	0.73	3.23

Table 42 The release rate of diclofenac sodium from Formulations 17-21 in pH change method.

Mean Time	Release Rate (%/hour)				
	Formulation 17	Formulation 18	Formulation 19	Formulation 20	Formulation 21
0.5	0.85	0.91	0.80	0.68	0.95
1.5	0.09	0.02	0.24	0.36	0.12
2.5	55.40	59.01	62.37	71.44	76.80
3.5	6.92	8.24	6.70	2.78	2.23
5	1.06	0.36	1.82	1.23	0.60
7.5	0.75	0.18	1.75	1.10	0.45
10.5	0.57	0.28	0.41	0.69	0.22
13.5	0.62	1.96	0.19	0.56	0.52
16.5	0.13	0.55	0.53	0.14	0.36
21	0.16	0.28	0.01	0.09	0.24

Table 43 Values for rate, amount released and the corresponding reciprocal for the release of blank diclofenac sodium and Voltaren SR from pH change method

Formulation	dQ/dt	Q	1/Q
Blank	0.18	0.18	5.556
	0.54	0.71	1.409
	75.40	76.11	0.013
	13.66	89.77	0.011
	2.32	94.41	0.011
	0.55	96.04	0.010
	0.54	97.67	0.010
	0.27	98.46	0.010
	0.17	98.98	0.010
	0.18	100.03	0.010

Formulation	dQ/dt	Q	1/Q
Voltaren SR	0.00	0.00	0.000
	0.00	0.00	0.000
	4.01	4.01	0.249
	6.40	10.41	0.096
	7.07	24.55	0.041
	5.90	42.24	0.024
	3.27	52.05	0.019
	2.45	59.40	0.017
	1.75	64.64	0.016
	1.54	73.88	0.014

Table 44 Values for rate, amount released and the corresponding reciprocal for the release of Formulations 1-3 from pH change method

Formulaton	dQ/dt	Q	1/Q
1	0.99	0.99	1.010
	1.11	2.09	0.479
	7.47	9.56	0.105
	2.86	12.42	0.081
	6.27	24.96	0.040
	7.76	48.24	0.021
	6.19	66.82	0.015
	3.40	77.02	0.013
	4.27	89.81	0.011
	0.96	95.56	0.011
2	0.98	0.98	1.020
	0.79	1.77	0.565
	9.72	11.49	0.087
	5.41	16.90	0.059
	5.02	26.95	0.037
	6.50	46.44	0.022
	6.92	67.21	0.015
	4.49	80.69	0.012
	4.34	93.72	0.011
	0.65	97.63	0.010

Formulaton	dQ/dt	Q	1/Q
3	0.92	0.92	1.087
	0.52	1.43	0.699
	14.27	15.70	0.064
	8.66	24.36	0.041
	7.06	38.47	0.026
	9.10	65.75	0.015
	4.63	79.65	0.013
	1.72	84.80	0.012
	3.11	94.12	0.011
	0.51	97.19	0.010

Table 45 Values for rate, amount released and the corresponding reciprocal for the release of Formulations 4-7 from pH change method.

Formulation	dQ/dt	Q	1/Q
4	0.70	0.70	1.429
	1.07	1.77	0.565
	5.02	6.79	0.147
	2.40	9.19	0.109
	4.31	17.81	0.056
	2.60	25.62	0.039
	2.31	32.56	0.031
	0.95	35.41	0.028
	0.71	37.55	0.027
	1.01	43.59	0.023
5	0.47	0.47	2.128
	1.23	1.71	0.585
	7.18	8.89	0.113
	3.96	12.85	0.078
	5.20	23.25	0.043
	6.01	41.28	0.024
	2.24	48.00	0.021
	1.25	51.75	0.019
	1.87	57.38	0.017
	1.02	63.48	0.016

Formulation	dQ/dt	Q	1/Q
6	0.82	0.82	1.220
	0.84	1.66	0.602
	7.26	8.92	0.112
	11.34	20.26	0.049
	7.65	35.56	0.028
	5.65	52.52	0.019
	4.82	66.98	0.015
	4.12	79.33	0.013
	3.38	89.47	0.011
	0.88	94.72	0.011
7	0.79	0.76	1.316
	0.97	1.73	0.578
	13.13	14.86	0.067
	9.36	24.22	0.041
	6.03	36.28	0.028
	6.40	55.48	0.018
	7.40	69.68	0.014
	3.53	80.28	0.013
	3.54	90.90	0.011
	0.66	94.87	0.011

Table 46 Values for rate, amount released and the corresponding reciprocal for the release of Formulations 8-10 from pH change method.

Formulation	dQ/dt	Q	1/Q
8	0.80	0.80	1.250
	0.05	0.85	1.177
	54.52	55.38	0.018
	4.36	59.73	0.017
	0.82	61.37	0.016
	0.63	63.26	0.016
	0.64	65.18	0.015
	0.75	67.43	0.015
	0.18	67.97	0.015
	0.61	71.63	0.014
9	1.18	1.18	0.848
	0.28	1.46	0.685
	80.01	81.47	0.012
	1.14	82.61	0.012
	0.46	83.52	0.012
	0.30	84.41	0.012
	0.01	84.45	0.012
	0.01	84.47	0.012
	0.13	84.87	0.012
	0.00	84.87	0.012

Formulation	dQ/dt	Q	1/Q
10	1.63	1.63	0.614
	0.33	1.96	0.510
	82.80	84.76	0.012
	1.07	85.83	0.012
	0.06	85.94	0.012
	0.05	86.09	0.012
	0.11	86.43	0.012
	0.05	86.59	0.012
	0.07	86.81	0.012
	0.04	87.05	0.012

Table 47 Values for rate, amount released and the corresponding reciprocal for the release of Formulations 11-16 from pH change method.

Formulation	dQ/dt	Q	1/Q
11	0.72	0.72	1.389
	0.84	1.56	0.641
	5.71	7.27	0.138
	5.16	12.42	0.081
	3.02	18.45	0.054
	2.95	27.30	0.037
	2.67	35.32	0.028
	1.78	40.66	0.025
	1.71	45.78	0.022
	1.38	54.08	0.019
12	0.76	0.76	1.316
	1.11	1.87	0.535
	7.77	9.63	0.104
	4.14	13.77	0.073
	2.78	19.32	0.052
	2.92	28.08	0.036
	2.06	34.25	0.029
	1.92	40.01	0.025
	3.26	49.80	0.020
	1.66	59.75	0.017
13	0.95	0.95	1.053
	1.56	2.51	0.398
	7.50	10.01	0.100
	6.39	16.41	0.061
	4.82	26.05	0.038
	5.17	41.56	0.024
	4.42	54.83	0.018
	2.88	63.46	0.016
	2.15	69.91	0.014
	1.45	78.60	0.013

Formulation	dQ/dt	Q	1/Q
14	0.52	0.52	1.923
	1.53	2.05	0.488
	9.32	11.37	0.088
	5.08	16.45	0.061
	7.12	30.69	0.033
	2.92	49.46	0.020
	3.84	60.98	0.016
	3.01	70.00	0.014
	2.66	77.96	0.013
	0.84	82.98	0.012
15	0.95	0.95	1.053
	0.63	1.58	0.633
	8.03	9.61	0.104
	6.43	16.04	0.062
	7.86	31.76	0.032
	10.16	62.24	0.016
	4.15	74.68	0.013
	1.91	80.40	0.012
	0.73	82.59	0.012
	0.73	86.99	0.012
16	0.86	0.86	1.163
	1.24	2.10	0.476
	5.27	7.37	0.136
	4.02	11.39	0.088
	3.25	17.89	0.056
	2.85	26.43	0.038
	3.52	36.98	0.027
	2.97	45.89	0.022
	4.24	58.61	0.017
	3.23	77.97	0.013

Table 48 Values for rate, amount released and the corresponding reciprocal for the release of Formulation 17-21 from pH change method.

Formulation	dQ/dt	Q	1/Q
17	0.85	0.85	1.177
	0.09	0.94	1.064
	55.40	56.34	0.018
	6.92	63.26	0.016
	1.06	65.38	0.015
	0.75	67.63	0.015
	0.57	69.34	0.014
	0.62	71.21	0.014
	0.13	71.58	0.014
	0.16	72.56	0.014
18	0.91	0.91	1.099
	0.02	0.92	1.087
	59.01	59.93	0.017
	8.24	68.18	0.015
	0.36	68.90	0.015
	0.18	69.45	0.014
	0.28	70.30	0.014
	1.96	76.17	0.013
	0.55	77.81	0.013
	0.28	79.47	0.013
19	0.80	0.80	1.250
	0.24	1.05	0.952
	62.37	63.42	0.016
	6.70	70.12	0.014
	1.82	73.76	0.014
	1.75	79.02	0.013
	0.41	80.25	0.013
	0.19	80.83	0.012
	0.53	82.42	0.012
	0.01	82.50	0.012

Formulation	dQ/dt	Q	1/Q
20	0.68	0.68	1.471
	0.36	1.03	0.971
	71.44	72.47	0.014
	2.78	75.25	0.013
	1.23	77.70	0.013
	1.10	80.99	0.012
	0.69	83.05	0.012
	0.56	84.73	0.012
	0.14	85.14	0.012
	0.09	85.65	0.012
21	0.95	0.95	1.053
	0.12	1.07	0.935
	76.80	77.87	0.013
	2.23	80.10	0.013
	0.60	81.30	0.12
	0.45	82.65	0.012
	0.22	83.30	0.012
	0.52	84.86	0.012
	0.36	85.92	0.012
	0.24	87.33	0.012

Appendix C

Data In Statistical Processes

Table 49 Comparison of linearity between plots of rate of release against reciprocal and amount of diclofenac sodium released from the microparitcles in buffer pH 6.8.

Formulation	Polymer:Drug	Microparticles	Correlation Coefficient of rate	
			versus Q	versus 1/Q
2	HPMC:DS 1:4	1	0.3653	0.3316
		2	0.4364	0.3390
		3	0.5113	0.5905
3	HPMC:DS 1:6	1	0.8073	0.8153
		2	0.7222	0.6902
		3	0.6619	0.6159
7	EC:DS 1:6	1	0.7846	0.8731
		2	0.8513	0.8714
		3	0.8612	0.8271
11	(HPMC:EC):DS (1:1):4	1	0.9066	0.9570
		2	0.8073	0.6346
		3	0.7671	0.8855
14	(HPMC:EC):DS (1.5:1):12	1	0.6446	0.5097
		2	0.6458	0.7042
		3	0.6564	0.7038
19	(HPMC:CT):DS (1:1):12	1	0.7342	0.7282
		2	0.6458	0.7042
		3	0.6564	0.7038
21	(HPMC:CT):DS (1:2):12	1	0.6032	0.4844
		2	0.3194	0.5737
		3	0.3590	0.4397

Table 50 The t-values of linearity between rate of release against reciprocal amount and amount.
(degree of freedom = 4, data from Table 49)

Formulation	Polymer:Drug	t-value*	Result**
2	HPMC:DS 1:4	-0.182	NS
3	HPMC:DS 1:6	-0.325	NS
7	EC:DS 1:6	0.875	NS
11	(HPMC:EC):DS (1:1):4	-0.012	NS
14	(HPMC:EC):DS (1.5:1):12	-2.839	S
19	(HPMC:CT):DS (1:1):12	1.147	NS
21	(HPMC:CT):DS (1:2):12	0.742	NS

* If $\alpha = 0.05$, degree of freedom = 4
then critical values of t are $\pm$ 2.776
** S = Significance
NS = Non-significance

Table 51 The t-values of percentage drug release.
(degree of freedom = 20 , data from Tables 31-33 , 35)

Product I	Product II	t-value*	Result**
HPMC:DS 1:2	HPMC:DS 1:4	-0.097	NS
HPMC:DS 1:2	HPMC:DS 1:6	-0.443	NS
HPMC:DS 1:4	HPMC:DS 1:6	-0.344	NS
EC:DS 1:4	EC:DS 1:6	-0.108	NS
(HPMC:EC):DS (1:1):4	(HPMC:EC):DS (1:1):8	-0.201	NS
EC:DS 1:2	Voltaren SR	-0.175	NS
(HPMC:EC):DS (1:1):12	Voltaren SR	0.241	NS

* If $\alpha = 0.05$, degree of freedom = 20
then critical values of t are $\pm$ 2.086
** NS = Non-significance

VITAE

Miss Nantharat Pearnchob was born on August 10, 1971, She got her degree in Bachelor of Science in Pharmacy in 1993 from Faculty of Pharmaceutical Science, Chulalongkorn University, Bangkok, Thailand.