

References

1. Majors, R.E. Sample preparation for HPLC and Gas Chromatography using solid-phase extraction. LC-GC 4(1986): 981-984.
2. Early, R and Blakie. The technology of dairy products. Academic & Professional. New York: VCH Publishers, Inc. 1994.
3. Harper, W.J. and Hall, C.W. Dairy technology and engineering. AUI Publishing company, Inc. 1981.
4. Marshall, R.J. Standard methods for the examination of dairy products. 16 th ed. American Public Health Association, 1992.
5. Zeif, M. and Kiser, R. Solid phase extraction for sample preparation. Phillipsburg. J.T. Baker Inc., 1988.
6. Junk, G.A., and Richard, J.J. Organics in water: Solid-phase extraction on a small scale. Anal. Chem. 60(1988): 451-454.
7. Brooks, M.W., Tessier, D. and Soderstrom, D. A. rapid method for the simultaneous analysis of chlorpyrifos, isofenphos, carbaryl, iprodione, and triadimefon in groundwater by solid phase extraction. J. Chromatogr. Sci. 28(1990): 487-489.
8. John W.E., Fendinger, N.J., and Plimmer, J.R. Solid-Phase extraction of pesticides from water: Possible interferences from dissolved organic material. Anal.Chem. 63(1991):1510-1513.
9. Vinuesa, J.M., Cortes, J.C. M., Canas, C.I., and Perez, G.F. Isolation and concentration of organophosphorus pesticides from water using a C₁₈ reversed phase. J. Chromatogr. 472(1989): 365-370.
10. Chladak, E. and Marano, R.S. Use of bonded phase silica sorbents for the sampling of priority pollutants in wastewater. J. Chromatogr. Sci. 22(1984): 313-320.

11. Deans, I.S., Davidson, C.M., Littlejohn, D., and Brown, I. Factors affecting solid-phase extraction of semi-volatile organic pollutants from acidic industrial effluent for analysis by gas chromatography. Analyst. 118(1993): 1375-1381.
12. Beltran, J., Lopez, F.J., and Hernandez, F. Solid-phase extraction of pesticide residues from ground water: Comparison between extraction cartridges and extraction discs. Anal. Chim. Acta. 283 (1993): 297-303.
13. Loconto, P.R. Solid-phase extraction in trace environmental analysis, Current research-Part I. LC-GC. 9(1991): 460-465.
14. Loconto, P.R. Solid-phase extraction in trace environmental analysis, Current research-Part II. LC-GC. 9(1991): 752-760.
15. Mc Donnell, T., Rosenfeld, J., and Rais -Firouz, A. Solid-phase sample preparation of natural waters with reversed-phase disk. J. Chromatogr. 629(1993): 41-53.
16. Sittig, M. Handbook of toxic and hazardous chemicals and carcinogens. 2nd ed. U.S.A.: Noyes. Publication, 1985. pp.(225-281), (659-661).
17. Sittig, M. Pesticide manufacturing and toxic material control encyclopedia. U.S.A.: Noyes. Data corporation, 1985. pp.(271-272), (319-320).
18. Hochson, E., Mailman, R.B. and Chamber, J. E. Dictionary of toxicology. Van Nostrand Reinhold Company Inc., 1988. pp. 121, 125, 297.
19. Bade, M.Z., Handler, J.A., Whittaker, M. Kaufman, F. C. and Thurman, R. G, Interactions between plasticizers and fatty acid metabolism in the perfused rat liver and *in VIVO* inhibition of ketogenesis by 2-ethylhexanol. Biochemical Pharmacology 39(1990): 715-721.
20. Bany Y. A., Labow, R. S., Kean, W. J. Toxicology and Applied Pharmacology 106(1990):48-52.

21. Mentlein, R., and Butte, W. Hydrolysis of phthalate esters by purified rat and human liver carboxylesterases. Biochemical Pharmacology. 38 (1989):3126-3128.
22. Liang, D., Keller, B. J., Misra, U. K., and Thurman, R. G. Oxygen tension is a major determinate of hepatotoxicity due to 2-ethylhexanol in isolated tissue cylinders from periportal and pericentral regions of the liver lobule from phenobarbital-treated rats. Toxicology and Applied Pharmacology 107(1991): 344-349.
23. Bahr, M.Z. Introduction of peroxisomal enzyme activities by di-(2-ethylhexyl)phthalate in thyroidectomized rats with parathyroid replants. The American Society for Pharmacology and Experimental Therapeutics. 263(1993):1105-1110.
24. Wu, C., Jiang, Y., Cao, J. and Xue, H. A new pharmacological function of phthalate ester plasticizer. Leukemia Research. 17(1993): 1013-1016.
25. Mellan, I. The Behavior of Plasticizers. Sussex:Pergamon Press, Inc. 1961.
26. Majors, R.E. New devices and instrumentation for sample preparation in chromatography. LC-GC 7(1989): 92-100
27. Markell, C., Hagen, D. F. and Bunnelle, V.A. New technologies in solid-phase extraction(sample preparation perspective). LC-GC 9(1991): 332-337.
28. Zief, M. and Kiser, R. An overview of solid phase extraction for sample preparation. Am.Lab. 22(1990): 71-83.
29. Tippins, B.L. Solid phase extraction fundamentals. Am.Lab.19(1988): 273-274
30. Hagen, D.F., Markell, C.G., Schmitt, G.A., and Blenvins, D.D. Membrane approach to solid-phase extraction. Anal. Chim.Acta. 236(1990): 157-164.

31. Majors, R. E. Sample preparation perspectives: Automation of solid-phase extraction. LC-GC. 11(1993): 336-342.
32. Lane, Y. Automated sample preparation using sorbent extraction. Am. Lab. 118(1985): 120-126.
33. Hodgson, J., Collins, J. and Bashe, W. Determination of acid herbicides in aqueous samples by liquid-solid disk extraction and capillary gas chromatography. J. Chromatogr 569(1994) 395-401
34. Schmidt, L., Sun, J. J., Fritz, J. S., Hagen, D.F., Markell, C. G., and Wisted, E. E. Solid-phase extraction of phenols using membranes loaded with modified polymeric resins. J. Chromatogr. 641(1993): 57-61.
35. Dirksen, T. A., Price, S. M., and St. Mary, S. J. Solid-phase disk extraction of particulate-containing water samples. Am. Lab. 23 (1993): 24-27.
36. Lensmeyer, G.L., Wiebe, D.A., and Darcey, B.A. Application of a novel form of solid-phase sorbent (Empore® Membrane) to the isolation of tricyclic antidepressant drugs from blood. J. Chromatogr. Sci. 29 (1991): 444-449.
37. Nelis, H.J., Merchie, G., Lavens, P., Sorgeloos, P., and De Leenheer, A.P. Solid-phase extraction of ascorbic acid 2-sulfate from cysts of the brine shrimp *Artemia franciscana*. Anal. Chem. 66(1994): 1330-1333.
38. Toyoda, M., Adachi, K., Ida, T., Noda, K., and Minagawa, N. Simple analytical method for organophosphorus pesticide residues in milk. J. AOAC. 73(1990): 770-772.
39. Kroneld, R., and Reunanen, M. Determination of volatile pollutants in human and animal milk by GC-MS. Bull. Environ. Contam. Toxicol. 44(1990): 917-923.

40. Moats, W. A., and Harik-Khan, R. Liquid chromatographic determination of β -lactam antibiotics in milk: A multiresidue approach. J. AOAC Int. 78(1995): 49-58.
41. Indle, H. E., Littlejohn, V. C., Lawrence, R. J., and Woollard, D. C. Liquid chromatographic determination of vitamin K₁ in infant formulas and milk. J. AOAC Int. 78(1995): 719-723.
42. Bentabol, A., and Jodral, M. Determination of organochlorine pesticides in cheese. J. AOAC Int. 78(1995): 94-98.
43. Tasi, C., and Kondo, F. Liquid chromatographic determination of fluorescent derivatives of six sulfonamides in bovine serum and milk. J. AOAC Int. 78(1995): 674-678.
44. Weiss, G., Laurencot, H. J., MacDonald, A., Duke, P. D., Misra, K., Horton, G. M., Katz, S. E., and Brady, M. S. Determination of sulfadimethoxine withdrawal time from milk. Part I : Dosing, sampling, and assay. J. AOAC Int. 78(1995): 358-370.
45. Lagana, A., Fago, A., Marino, A., and Pardo-nartinez, B. Rapid method for determination of phenylurea herbicides in milk. Chromatographia 38(1994): 88-92.
46. Arenas, R. V., and Johnson, N. A. Liquid chromatographic fluorescence method for multiresidue determination of thiabendazole and 5-hydroxythiabendazole in milk. J. AOAC Int. 78(1995): 642-646.
47. Long, A.R., Hsiem, L.C., Malbrough, M.S., Short, C.R., and Barker, S.A. Multiresidue method for isolation and liquid chromatographic determination of seven benzimidazole anthelmintics in milk. J. AOAC. 72(1989): 739-741.
48. Muccio, A.Di., Rizzica, M., Ausili, A., Camoni I., Dommarco, R., and Vergori, F. Selective, on-column extraction of organochlorine pesticide residues from milk. J. chromatogr. 456(1988): 143-148.

49. Voirin, A., and Letavernier, J-F. Improvement of extraction and concentration of milk peptides with solid-phase cartridges for analysis by high-performance liquid chromatography. J. chromatogr. 553 (1991): 155-164.
50. Qian, G-S., Yasei, P., and Yang G.C. Rapid extraction and detection of Aflatoxin M₁ in Cow's milk by High-performance liquid chromatography and radioimmunoassay. Anal. Chem. 56(1984): 2079-2080.
51. Prapamontol, T., and Stevenson, D. Rapid method for the determination of organochlorine pesticides in milk. J.Chromatogr. 552(1991): 251-257.
52. Van Poucke, L. S. G., Depourcq, G. C. I., and Van Peteghem, C.H. A quantitative method for the detection of sulfonamide residues in meat and milk samples with a high-performance thin-layer chromatographic method. J. Chromatogr. Sci. 29(1991): 423-427.
53. Baynes, R.E., and Bowen, J.M. Rapid determination of methyl paraoxon in milk by gas chromatography with solid-phase extraction and flame photometric detection. J.AOAC. Int. 78(1995): 812-814.
54. Manes, J., Font, G., and Pico, Y. Evaluation of a solid-phase extraction system for determining pesticide residues in milk. J. Chromatogr. 642(1993): 195-204
55. Yoshida, K., and Kondo, F. Procedure for liquid chromatographic determination of thiamphenicol in bovine serum and milk. J. Liq. Chromatogr. 17(1994): 2625-2632.
56. Kirchmann, E., Earley, R. L., and Welch, L. E. The electrochemical detection of penicillins in milk. J. Liq. Chromatogr. 17(1994): 1755-1772.

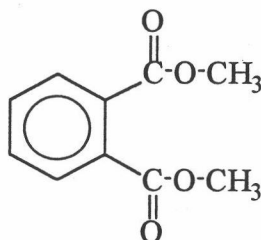
57. Agarwal, Y.K. Application of solid phase extraction for the analysis of sulfonamides in milk by high performance liquid chromatography. J. Liq. Chromatogr. 16(1993): 3793-3799.
58. Moran, J. W., Turner, J. M., and Coleman, M. R. Determination of monensin in edible bovine tissues and milk by liquid chromatography. J.AOAC Int. 78(1995): 668-673.
59. Liem, A.K.D., De Jong, A.P.J.M., Marsman, J.A. A rapid clean-up procedure for the analysis of polychlorinated dibenzo-p-dioxins and dibenzofurans in milk samples. Chemosphere 20(1990): 843-850.
60. Todoroki, T., Imai, K., Matsumoto, K., and Kano, S. Initial deactivation of Florisil adsorbent for column chromatographic separation of lipids. Analyst. 108 (1983): 1267-1269.
61. Lopez-Avila, V., Milanes, J., and Dodhiwala, N.S. Clean up of environmental sample extracts using Florisil solid-phase extraction cartridges. J. Chromatogr. Sci. 27(1989): 209-215.
62. Furtmann, K. Phthalates in surface water-a method for routine trace level analysis. J. Fresenius Z. Anal.Chem. 348(1994): 291-296.
63. Snell, R.P. Solid-phase extraction and liquid chromatographic determination of monophthalates and phthalide extracted from solution administration sets. J. AOAC. Int. 76(1993): 531-534.
64. Vitali, M., Leoni, V., Chiavarini, S., and Cremisini, C. Determination of 2-ethyl-1-hexanol as contaminant in drinking water. J. AOAC .Int 76(1993): 1133-1137.
65. Leibowitz, J. N., Sarmiento, R., Dugar, S.M., and Ethridge, M. W. Determination of six common phthalate plasticizers in grain neutral spirits and vodka. J. AOAC.Int 25(1995): 730-735.
66. Cerbulis, J., and Ard, J.S. Method for isolation and detection of dioctyl phthalate from milk lipids. J. AOAC.Int 50(1967): 646-650.

67. Sharman, M., Read, W. A., Castle, L., and Gilbert, J. Levels of di-(2-ethylhexyl)phthalate and total phthalate esters in milk, cream, butter and cheese. Food additives and contaminants. 11(1994): 375-385.
68. Ionel Rosenthal, Milk and Dairy Products, Balaban Publishers Weinheim, Germany, 1991, 1-63.
69. Mathews, C.K. and Van Holde, K.E., Biochemistry. The Benjamin/comming Publishing Company Inc. 1991.
70. Voet, D. and Voet, J.G., Biochemistry, John Wiley & Sons, Inc., 1990.
71. Ahyja, S. Trace and ultratrace analysis by HPLC. New York: John Wiley & Sons, Inc., 1992.
72. Van Horne, K.C., ed. Sorbent extraction technique. Harbor city: Analytical chem International, Inc., 1985.
73. Hiruntanakitjakul, S., Analysis of some phthalate esters in water by solid phase extraction, Master's thesis, Graduate School, Chulalongkorn University, 1994.
74. Kawahara, F.K., and Hodgeson, J.W. Determination of phthalate and adipate esters in drinking water by liquid-liquid extraction or liquid-solid extraction and gas chromatography with photoionization detection. U.S. EPA Method 506, Ohio: Environmental Monitoring System Laboratory, U.S. EPA (1990) pp.5-32.
75. Grob, R.L., ed. Modern Practice of gas chromatography 2nd ed. New York: John Wiley & Sons, Inc., 1985.
76. Verschueren, K. Handbook of environmental data on organic chemicals, New York: Van Norstrand Reinhold Company Inc., 1977.

APPENDIX A

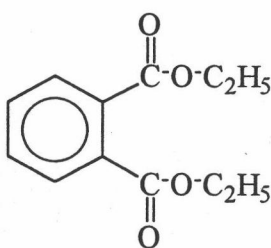
Physical and chemical properties of phthalate esters (76)

1. Dimethyl phthalate



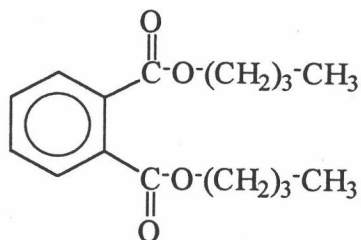
Molecular weight : 194.18
Specific gravity : 1.189 at 25/25 °C
Boiling point : 282 °C at 760 mmHg
Solubility in water : 0.5 g/100g at 20 °C

2. Diethyl phthalate



Molecular weight : 222.23
Specific gravity : 1.123 at 25/4 °C
Boiling point : 296.1 °C at 760 mmHg
Solubility in water : 0.1 g/100g at 20 °C

3. Di-n-butyl phthalate



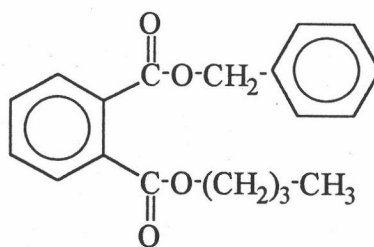
Molecular weight : 278.34

Specific gravity : 1.047-1.051 at 20/20 °C

Boiling point : 340.0 °C at 760 mmHg

Solubility in water : 0.45 g/100g at 25 °C

4. Butylbenzyl phthalate



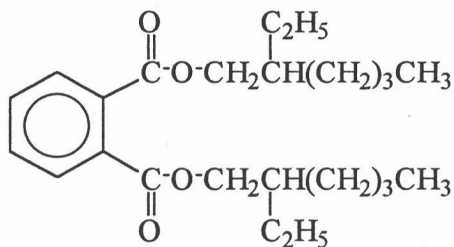
Molecular weight : 312.37

Specific gravity : 1.111-1.119 at 25/25 °C

Boiling point : 370.0 °C at 760 mmHg

Solubility in water : Insoluble

5. Di (2-ethylhexyl) phthalate



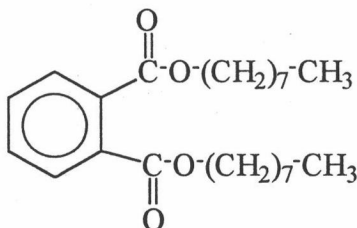
Molecular weight : 391.0

Specific gravity : 0.985 at 20/20 °C

Boiling point : 370.0 °C at 760 mmHg

Solubility in water : 0.01 g/100g at 20 °C

6. Di-n-octyl phthalate



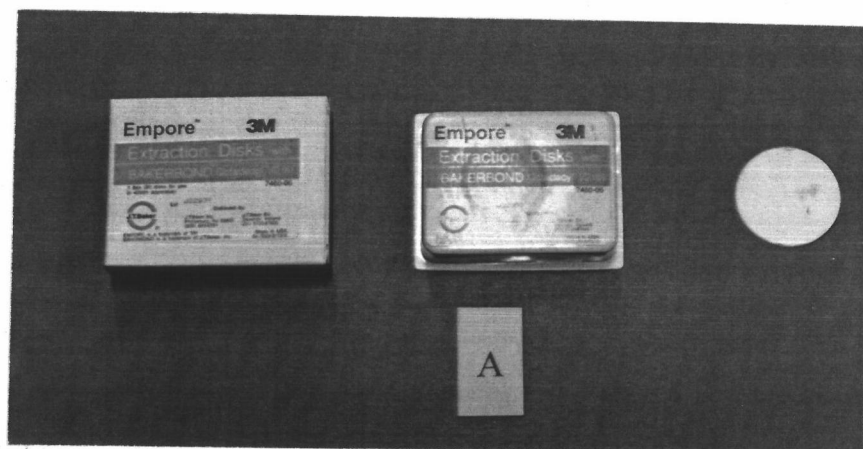
Molecular weight : 391.0

Specific gravity : 0.978 at 20/4 °C

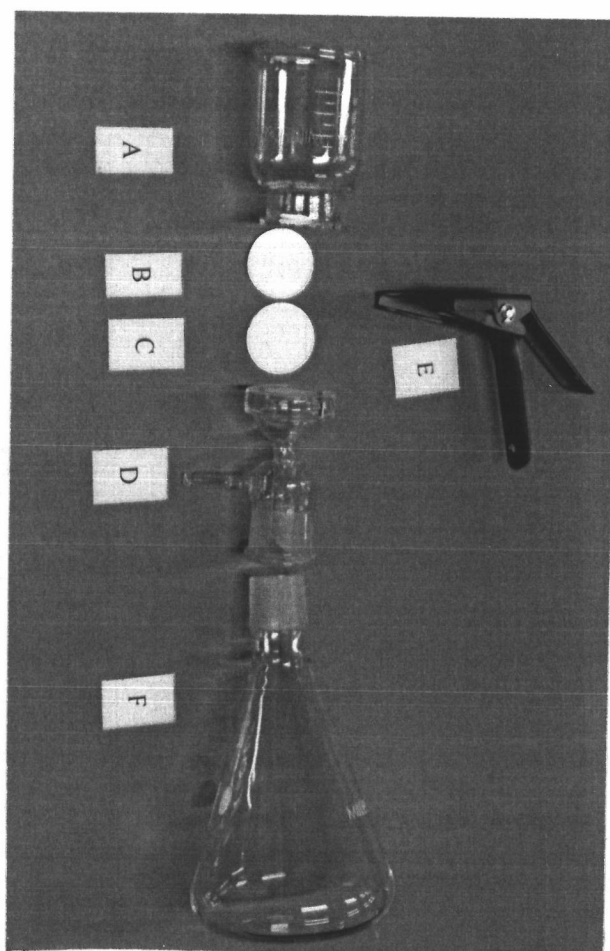
Boiling point : 220.0 °C at 4 mmHg

Solubility in water : Insoluble

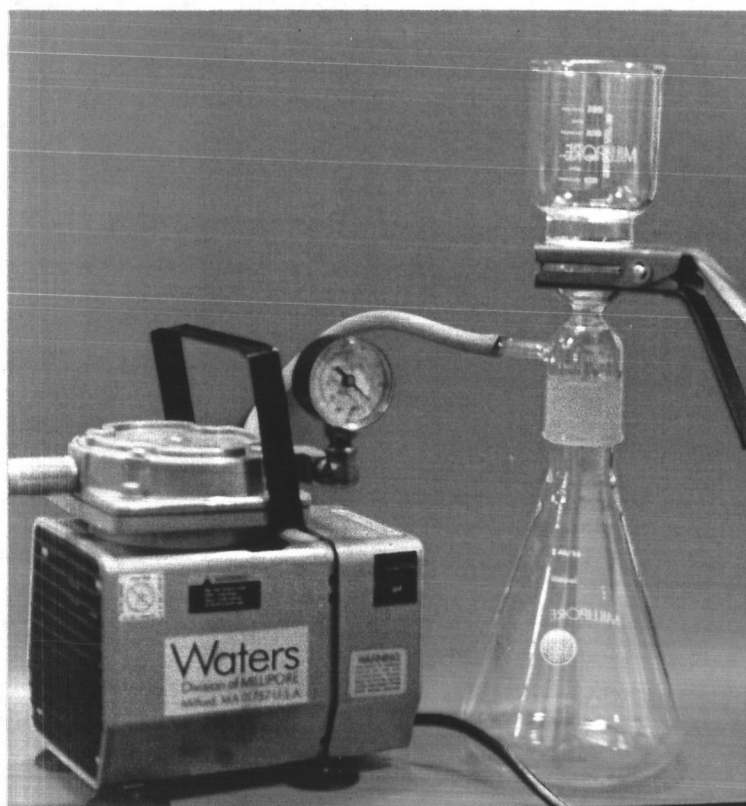
APPENDIX B

A : Empore Extraction Disks C₁₈

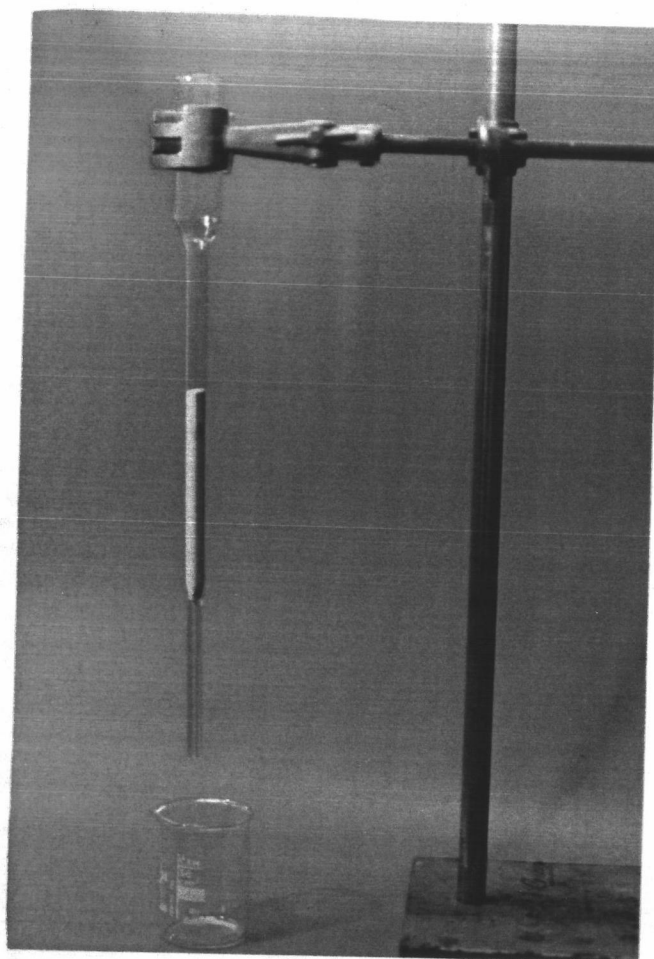
B : Graded density Glass microfiber filter, 47 mm



- A : Graduated funnel
- B : Graded density Glass microfiber filter, 47 mm
- C : Empore Extraction Disks C₁₈
- D : Disk base
- E : Clamp
- F : 1-liter suction flask



Demonstrated the Solid Phase Extraction Membrane Apparatus



Demonstrated the Clean Up Apparatus

VITA

Miss Kanchanavadee Amphaisri received a Bachelor Degree of Science (Chemistry) from Faculty of Science, Chulalongkorn University in 1993. Since 1994, she has been a graduate student studying Analytical Chemistry in Chulalongkorn University.

