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APPENDIX A

ANALYTICAL RESULTS OF GEOLOGICAL SAMPLES IN MAE KLONG WATERSHED AREA

Table A.1 Analytical results of geological samples in Mae Klong watershed area

	Al	Fe	Mn	Zn	Pb	Cu
KN1	23475	3343.96	743.1	20.14	9.32	19.63
	23350	3580.49	742.62	20.15	9.53	19.85
	23500	3327.75	739.5	19.63	10.01	20.15
KN2	8100	725.02	117.41	13.42	4.35	7.21
	8250	686.18	119.63	14.32	4.02	6.98
	7950	677.198	118.32	13.25	5.2	7.33
KN3	44700	19731	369.96	31.02	9.32	15.26
	45300	19020	356.35	29.81	8.56	16.32
	46100	19438	349.63	30.78	8.97	14.32
KN4	25400	3518.64	884.32	12.3	5.23	14.97
	25300	3483.47	893.19	12.56	5.26	15.61
	26550	3734.16	885.31	12.63	6.39	16.02
KN5	81600	45300.63	789.7	50.47	26.22	30.63
	79300	45639.03	808.01	51.31	26.96	30.9
	78890	44806.12	824.55	51.72	27.55	31.01
KN6	87800	51483.7	687.47	65.06	20.96	27.58
	86800	50873.75	671.37	64.47	21.96	28.69
	88800	51214.9	698.84	63.64	21.65	29.67
KN7	54125	13901.85	844.04	32.06	17.45	25.63
	55000	13262.05	835.89	33.96	18.02	26.41
	56210	13701.1	824.88	33.25	17.36	26.34
KN8	38900	11256.72	703.54	20.36	9.63	25.63
	38300	11389.64	693.29	21.45	8.98	25.42
	39400	11161.23	688.25	22.53	8.76	26.98
KN9	2850	1313.41	242.47	9.59	1.96	4.02
	2950	1392.22	236.41	10.5	1.85	4.38
	2900	1378.76	247.82	10.07	1.99	4.63

	Al	Fe	Mn	Zn	Pb	Cu
KN10	7700	2003.49	439.03	22.26	4.98	4.45
	7950	2084.61	462.52	22.14	5.18	4.57
	8100	2094.59	452.26	21.63	4.52	4.12
KN11	1750	115.88	112.14	7.1	1.99	2.29
	1780	117.42	103.6	6.9	2.01	2.52
	1740	118.32	108.32	7.1	2.12	2.69
KN12	2750	1108.44	259.69	9.72	1.91	2.65
	2730	1099.11	244.24	10.21	2.01	2.41
	2690	1119.14	254.35	9.82	1.95	2.77
KN13	5500	1001.22	252.49	12.45	4.04	4.35
	5700	1032.26	251.77	12.8	4.22	4.64
	5800	1027.84	244.72	11.74	4.52	4.16
KN14	3900	1833.85	238.16	15.57	3.42	2.98
	4000	1817.12	246.91	16.25	3.06	2.9
	3980	1813.53	248.42	15.9	3.57	3.02
KN15	76000	51214.9	645.7	60.84	23.64	24.26
	76500	52153	652.03	61.02	24.03	24.53
	76400	52627	665.23	62.32	25.01	25.21
KN16	80200	41044.88	679.25	51.8	23.34	27.53
	82000	40453.58	684.03	50.64	24.12	28.52
	81800	39963.32	688.28	52.01	24.15	26.35
KN17	31200	12118.24	463.24	24.52	14.54	20.12
	30960	12257.26	447.43	24.36	13.96	20.36
	31000	12621.56	435.97	25.32	13.26	21.01
KN18	3000	1694.45	15.81	9.79	2.65	12.36
	3040	1700.22	15.03	10.73	2.45	13.02
	2980	1634.2	16.32	9.22	2.87	12.35

	Al	Fe	Mn	Zn	Pb	Cu
KN19	17650	11887	905.73	33.96	15.69	16.32
	17400	11786	925.31	32.08	15.96	16.35
	17550	11640	891.59	33.52	16.02	15.02
KN20	51400	13209.3	474.33	34.61	20.13	15.36
	51100	13031.83	453.28	35.33	20.45	22.63
	51900	13196.69	479.87	33.99	21.03	15.32
KN21	5800	1424.77	362.23	18.92	5.77	7.12
	5950	1455.47	311.88	19.21	5.57	7.32
	6000	1430.59	345.68	19.03	6.03	6.95
KN22	62400	24922.25	518.69	29.63	20.05	21.36
	62600	24517.57	517.97	30.15	19.63	22.31
	62100	25058.7	523.36	32.52	19.43	22.51
KN23	67400	14559.5	447.23	40.12	20.15	20.15
	67800	14269.05	477.11	39.95	20.36	20.35
	68200	14714.12	482.87	39.52	19.63	19.63
KN24	84600	39051.85	696.27	52.88	28.63	28.63
	85600	39596.71	695.32	53.06	29.01	29.58
	84000	39424.88	664.85	53.66	29.56	30.78
KN25	14050	11003.64	954.98	34.05	6.45	14.25
	13950	12065.39	921.43	32.98	9.63	13.63
	14100	11485.79	923.17	33.56	9.87	14.23
KN26	9950	2728.63	312.49	30.12	19.58	7.53
	9630	2625.79	303.48	31.96	19.63	7.53
	9520	2680.92	324.32	32.15	19.98	7.69
KN27	78600	27091	493.51	54.55	19.63	24.12
	78020	27839.8	487.19	55.67	19.86	23.25
	77800	26981.04	473.35	54.43	20.96	22.11

	Al	Fe	Mn	Zn	Pb	Cu
KN28	2550	1412.61	292.26	12.36	4.11	5.02
	2450	1489.55	291.97	12.97	3.88	5.11
	2600	1443.38	283.3	13.02	4.23	5.23
KN29	2500	1004.3	136.95	9.13	6.32	10.96
	2450	1016.55	132.59	9.57	6.21	10.53
	2390	1056.32	133.83	9.19	6.1	11.35
KN30	5650	1229.21	327.3	9.78	9.12	3.02
	5700	1240.88	332.65	9.54	9.32	3.21
	5780	1265.3	335.2	10.03	9.63	3.41
KN31	15200	4697.49	102.6	17.44	11.23	13.25
	15300	4641.63	98.75	17.27	11.45	13.65
	15000	4635.09	97.58	17.07	11.62	14.23
KN32	11400	923.37	122.3	20.71	5.26	12.51
	11200	924.02	129.36	20.02	5.88	13.18
	11500	926.23	124.09	21.58	5.5	12.88
KN33	52200	14527.73	581.1	46.49	17.49	28.52
	51800	14307.34	590.17	46.98	18.6	28.63
	52100	14532.25	588.63	47.52	18.54	27.95
KN34	48000	16712.73	633.93	34.57	20.15	25.63
	48200	16318.86	635.55	34.96	21.65	25.75
	48300	16269.59	638.93	35.49	21.36	26.32
KN35	2990	2001.35	367.46	12.24	4.04	5.98
	3050	2020.67	362.68	12.95	4.52	6.14
	2900	2035.46	369.95	12.66	4.32	6.32
KN36	10250	7563.67	997.64	32.77	13.04	14.63
	10250	7444.9	1005.06	32.26	13.88	14.25
	10350	7785.83	981.98	32.35	13.59	14.89

	Al	Fe	Mn	Zn	Pb	Cu
KN37	97200	52765.02	946.08	66.01	29.61	30.21
	97800	50275.97	956.32	66.16	29.92	30.25
	98700	50159.5	988.12	67.16	29	30.63
R1	4750	2400.28	627.56	24.78	7.02	4.32
	4650	2453.35	638.27	24.53	6.52	4.52
	4870	2385.94	618.17	23.85	6.32	4.63
R2	3200	2822.83	352.85	23.02	5.32	7.36
	3100	2940.15	348.76	22.98	5.48	7.25
	3400	2898.36	350.8	22.68	4.98	7.29
R3	6350	2692.11	330.39	24.87	6.39	4.52
	6270	2662.24	352.23	24.5	6.48	4.18
	6400	2695	349.63	24.83	6.52	4.39
R4	2200	1797.13	287.54	30.26	5.12	4.98
	2350	1789.52	281.93	30.63	5.23	4.68
	2300	1800.32	289.15	30.28	5.26	4.71
R5	57800	22453	476.33	29.63	13.59	25.73
	57300	22486	475.45	29.58	13.56	25.42
	57500	22424	469.06	28.96	13.25	25.89
R6	56900	18123.36	996.52	32.69	12.36	23.35
	56700	18963.25	989.42	32.47	12.56	23.24
	56800	18872.25	978.33	33.01	12.48	23.12
R7	15450	6124.98	513.99	36.54	13.25	12.36
	15550	6115.81	513.72	36.53	13.56	12.56
	15500	6132.56	518.32	36.78	13.48	13.02
R8	17950	9706.23	69.68	39.63	14.68	10.23
	17980	9886.04	69.92	38.96	14.78	10.32
	18000	9805.23	73.95	39.45	15.02	10.56

	Al	Fe	Mn	Zn	Pb	Cu
R9	7550	3678.33	547.23	18.96	6.12	4.12
	7500	3664.68	549.74	18.32	6.32	4.35
	7500	3669.51	545.2	18.59	6.45	4.58
R10	5550	2528.05	995.43	20.19	5.98	2.56
	5500	2537.12	1020.53	20.52	6.01	2.86
	5450	2516.25	1008.53	19.98	6.21	2.36
R11	56600	28644.27	670.68	34.92	27.69	30.04
	56800	28539.66	672.95	35.04	27.63	31.21
	56900	28712.21	665.6	35.23	28.96	31.33
R12	66400	34753.9	411.3	40.97	18.3	25.79
	66800	34910.05	404.05	40.71	17.88	26.13
	66600	34823.15	416.46	40.35	18.02	25.37
R13	89800	43992.44	773.77	55.36	26.45	25.32
	89000	43290.43	785.36	55.23	26.48	24.12
	89500	43460.02	779.67	55.97	26.65	23.56
R14	88000	40271.4	947.32	59.63	27.32	31.52
	87000	40861.25	941	59.45	27.63	32.05
	87500	40635.28	953.21	58.98	27.82	32.59
R15	4090	1723.25	450.32	19.56	5.26	4.25
	4050	1772.81	426.31	19.85	5.96	4.36
	4000	1751.36	429.38	20.12	6.02	4.59
R16	3750	2194.02	369.45	17.53	5.36	6.52
	3500	2195.27	358.73	17.36	5.46	6.87
	3650	2175.95	348.21	17.26	5.26	6.78
R17	3000	1169.01	246.1	20.15	6.15	7.12
	3050	1175.23	262.97	20.63	6.12	7.36
	3020	1148.31	259.31	20.75	6.35	7.26

	Al	Fe	Mn	Zn	Pb	Cu
G1	82000	41578.36	544.12	62.36	27.45	29.65
	81800	41523.63	548.39	63.09	27.96	28.65
	82400	41625.3	539.68	63.45	28.12	29.31
B1	83400	36952.3	753.36	63.98	26.45	28.45
	83500	36960.25	745.96	64.25	26.35	27.96
	82900	36975.32	749.32	64.23	25.93	28.35
ST1	58130	19780.51	1093.87	42.91	13.18	25.89
	58340	19980.01	1098.9	43.41	13.91	25.74
	58770	19840.37	1099.45	42.95	13.66	26.04
ST2	76130	30657.04	696.86	51.23	21.98	27.45
	76905	30687.93	697.9	50.98	22.05	27.36
	76740	30689.25	689.67	51.42	21.58	27.85
ST3	63050	34715	1023.52	50.21	20.13	20.36
	63270	34763.21	1025.32	50.14	20.45	20.12
	63450	34753.6	1032.71	49.96	20.89	20.14
ST4	74170	32716.58	499.56	51.23	22.36	22.13
	74150	32759.36	489.21	51.78	23.04	22.36
	74140	32745.17	496.35	52	23.12	22.52
ST5	87450	44500	700	52.63	25.56	31.52
	87480	44498.35	697.55	52.98	25.68	32.52
	87460	44578.21	700	52.36	25.36	33.02
ST6	88510	42483.52	896.32	53.36	25.12	26.24
	88360	42560.21	897.3	53.12	25.14	25.42
	88740	42495.32	900.2	53.78	25.75	25.89

APPENDIX B

Fe CONCENTRATION OF LIMESTONES IN RATCHABURI PROVINCE

Figure B.1 Fe concentration of limestones in Ratchaburi province in ppm (Department of Mineral resources, 1993).

Fe	Fe	Fe	Fe
0.3	0.01	0.01	0.09
0.08	0.01	0.19	0.48
0.05	0.01	0.01	0.33
0.19	0.71	0.01	0.31
0.45	0.22	0.04	0.17
0.31	0.06	0.01	0.01
0.23	0.01	0.2	0.82
0.22	0.01	0.14	0.57
0.75	0.01	0.01	0.4
0.01	0.01	0.08	0.01
0.33	0.01	0.01	0.38
0.02	0.01	0.01	0.24
0.01	0.01	0.01	0.83
0.01	0.01	0.01	0.01
0.64	0.01	0.01	0.71
0.65	0.38	0.27	0.2
0.3	1.02	0.1	0.04
0.21	0.01	0.1	0.05
0.34	0.01	0.01	0.1
0.42	0.01	0.01	0.02
0.21	0.01	0.01	0.26
0.29	0.01	0.01	0.21
0.31	0.01	0.01	0.01
0.01	0.01	0.26	0.01
0.22	0.01	0.05	0.01

APPENDIX C

FIGURES SHOW METALS/REFERENCE ELEMENTS RELATIONSHIP

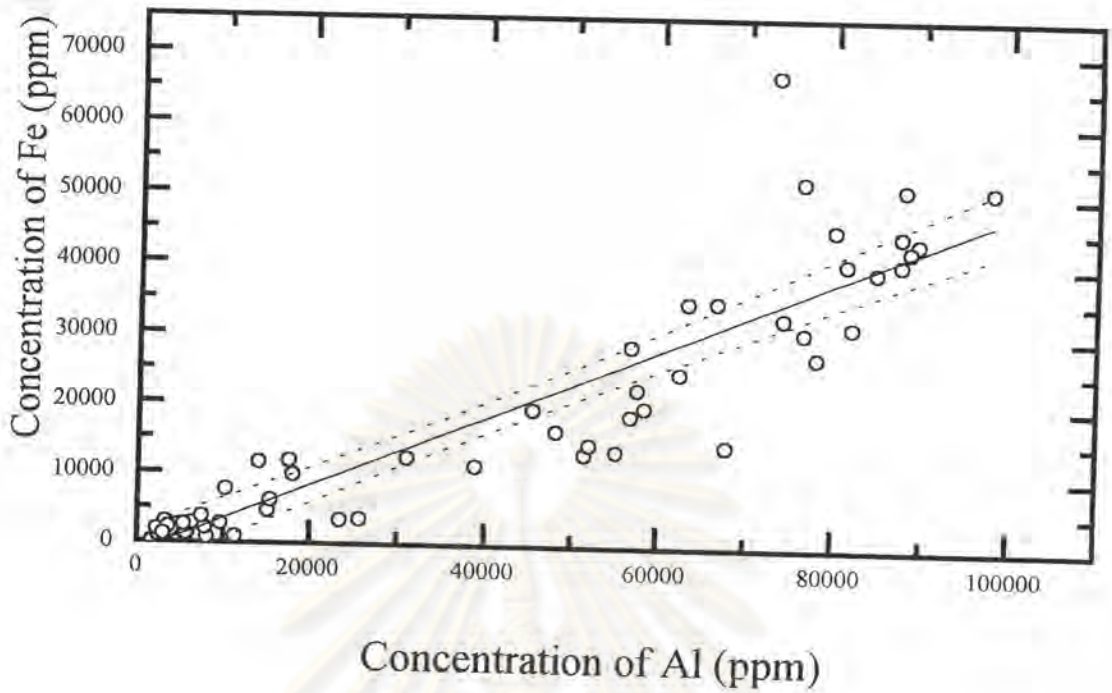

Figure C.1 Fe/Al relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

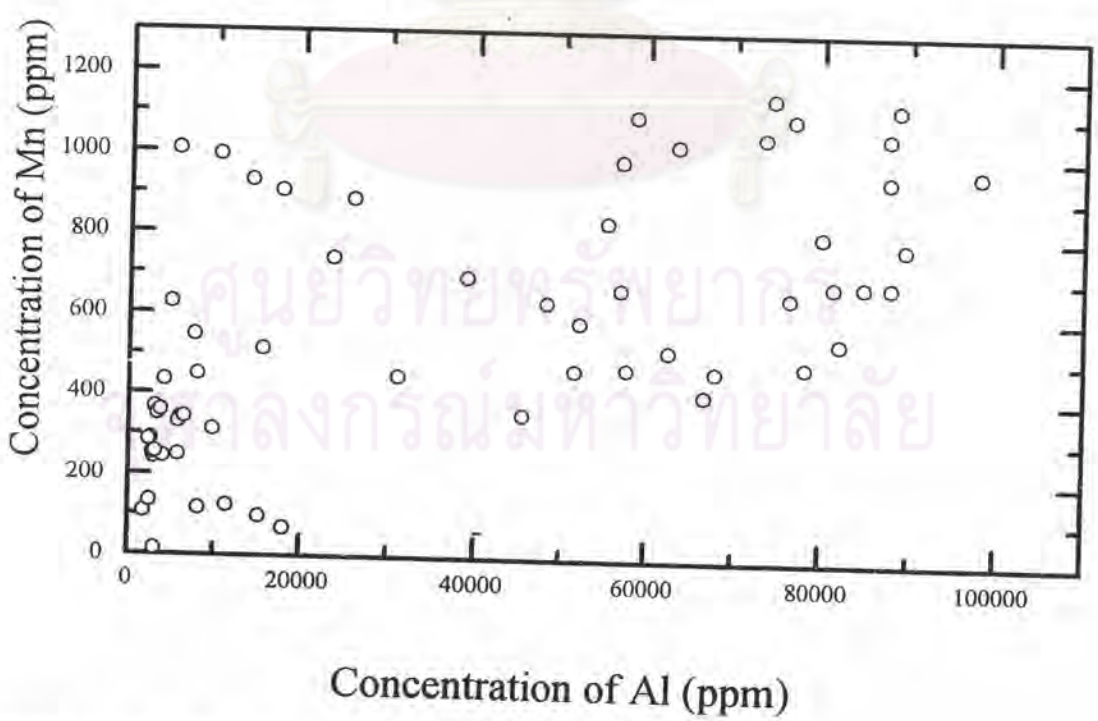

Figure C.2 Mn/Al relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

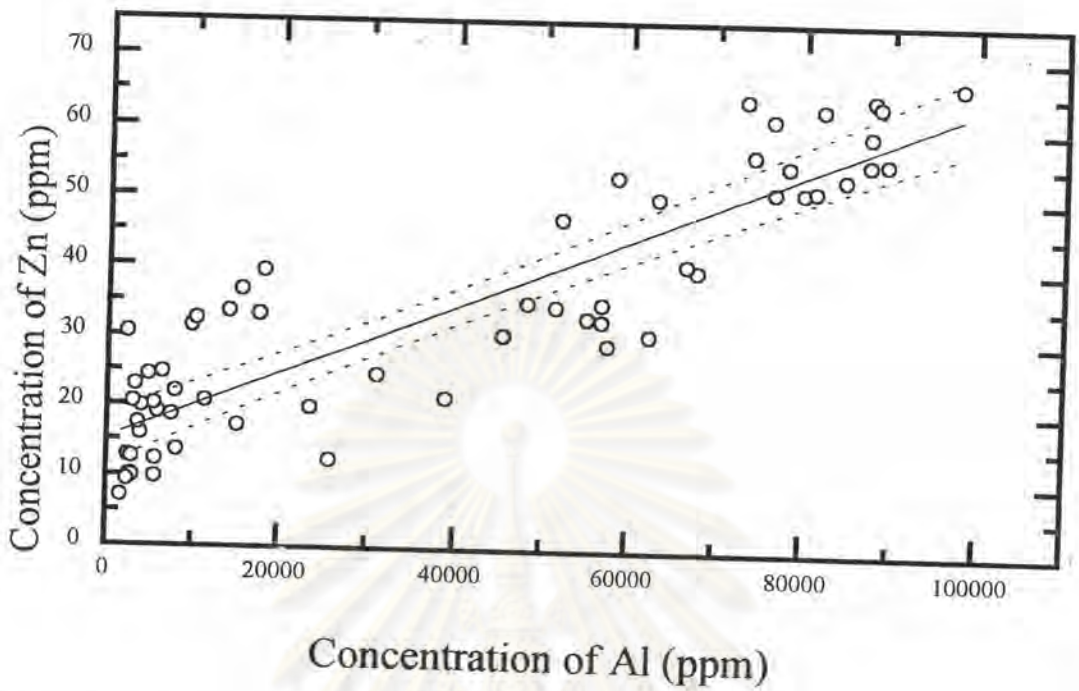

Figure C.3 Zn/Al relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

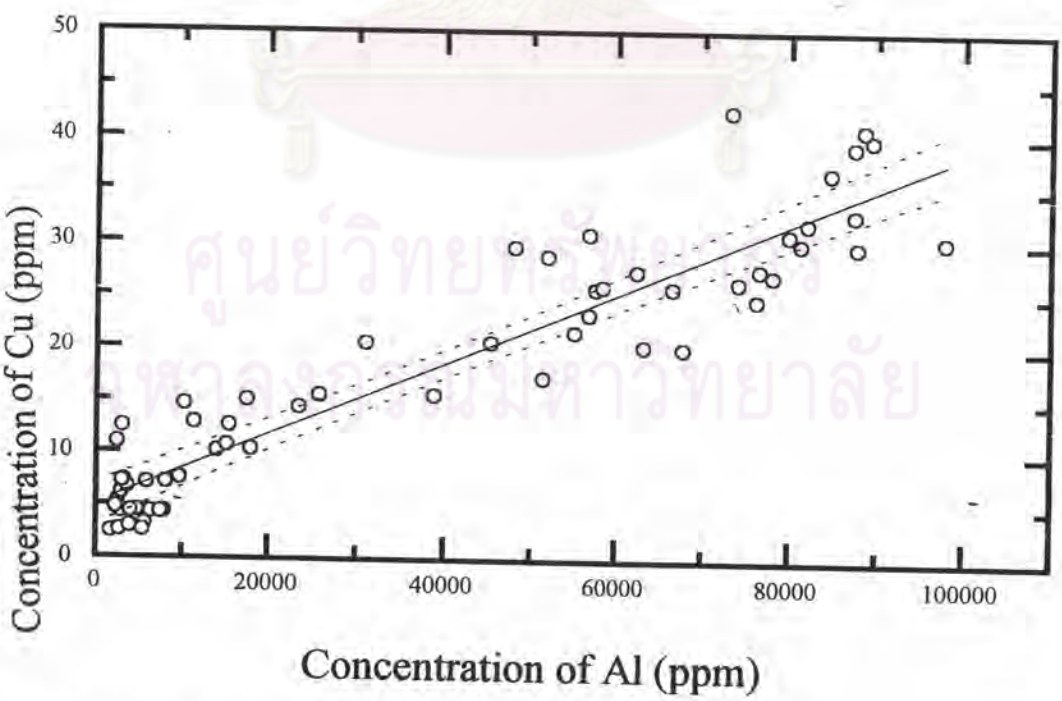

Figure C.4 Cu/Al relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

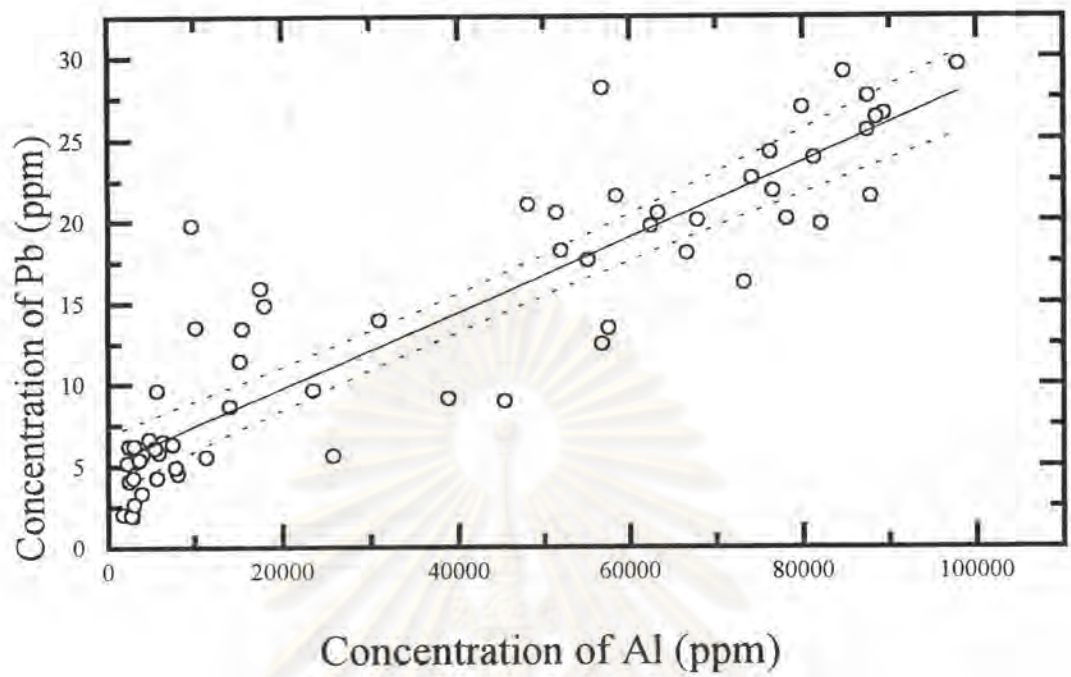

Figure C.5 Pb/Al relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

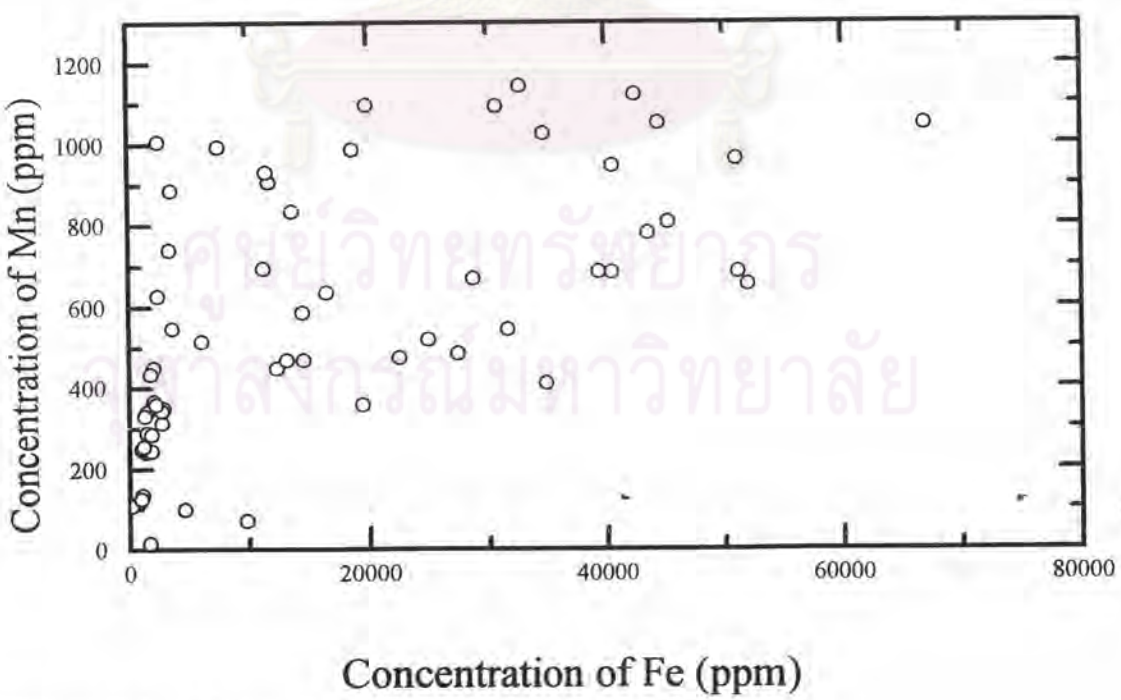

Figure C.6 Mn/Fe relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

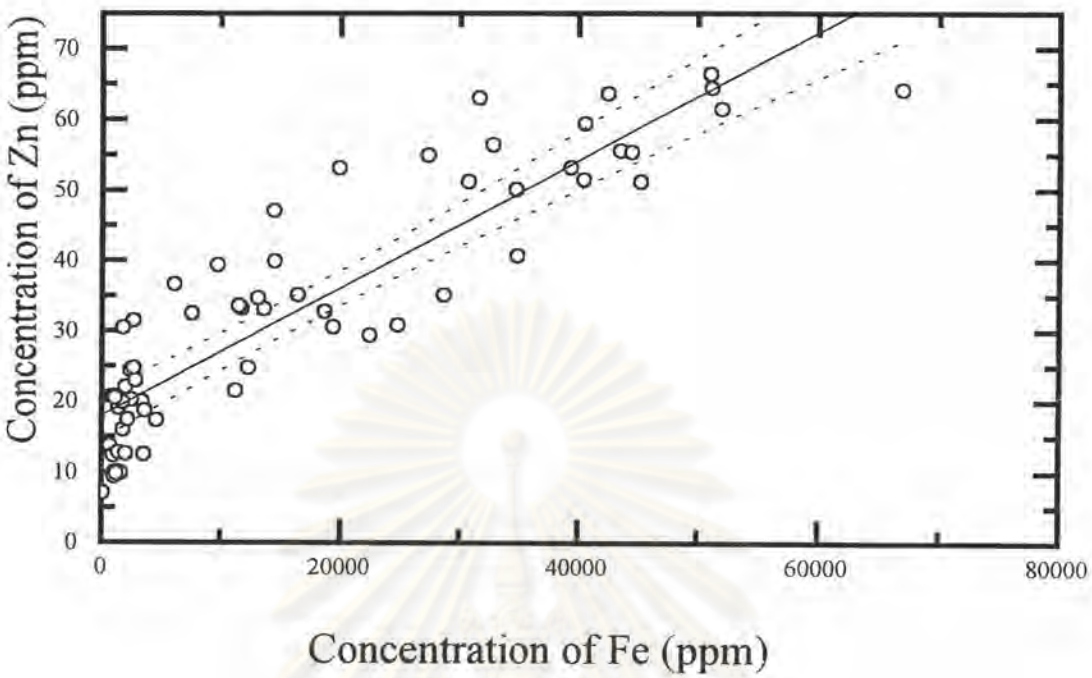

Figure C.7 Zn/Fe relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

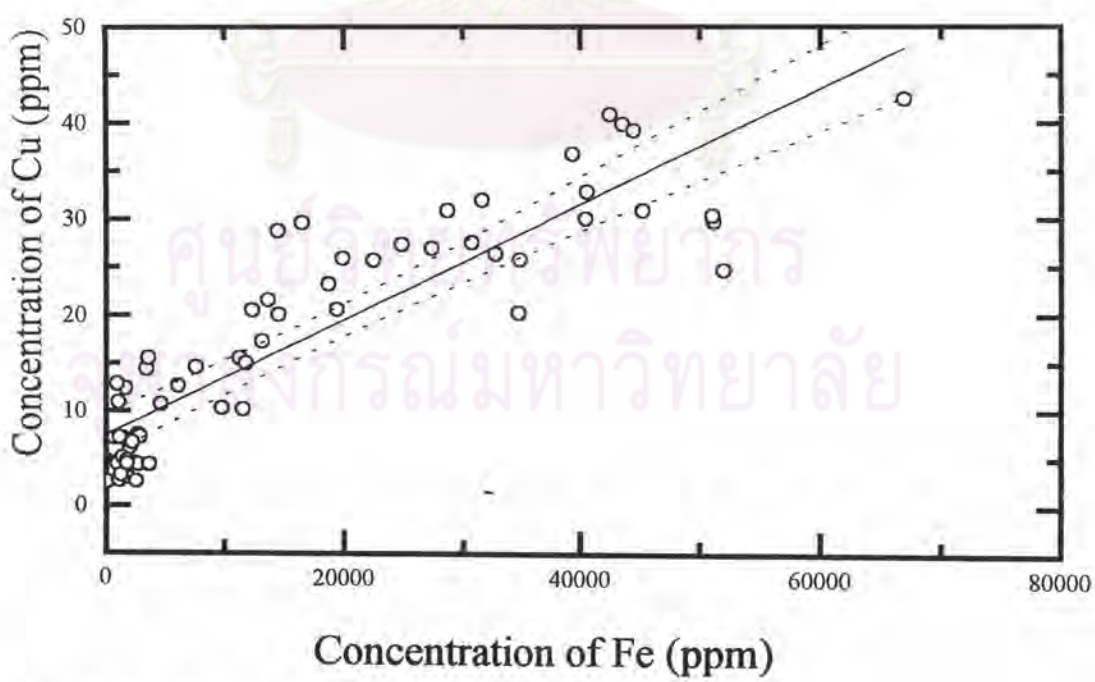

Figure C.8 Cu/Fe relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

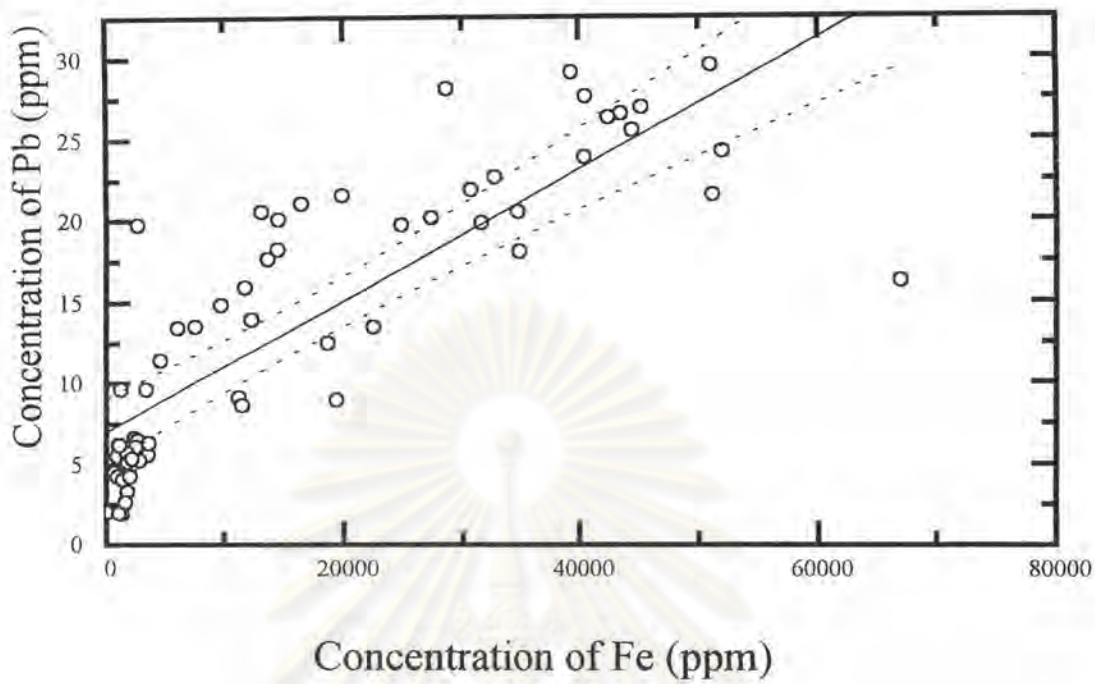

Figure C.9 Pb/Fe relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

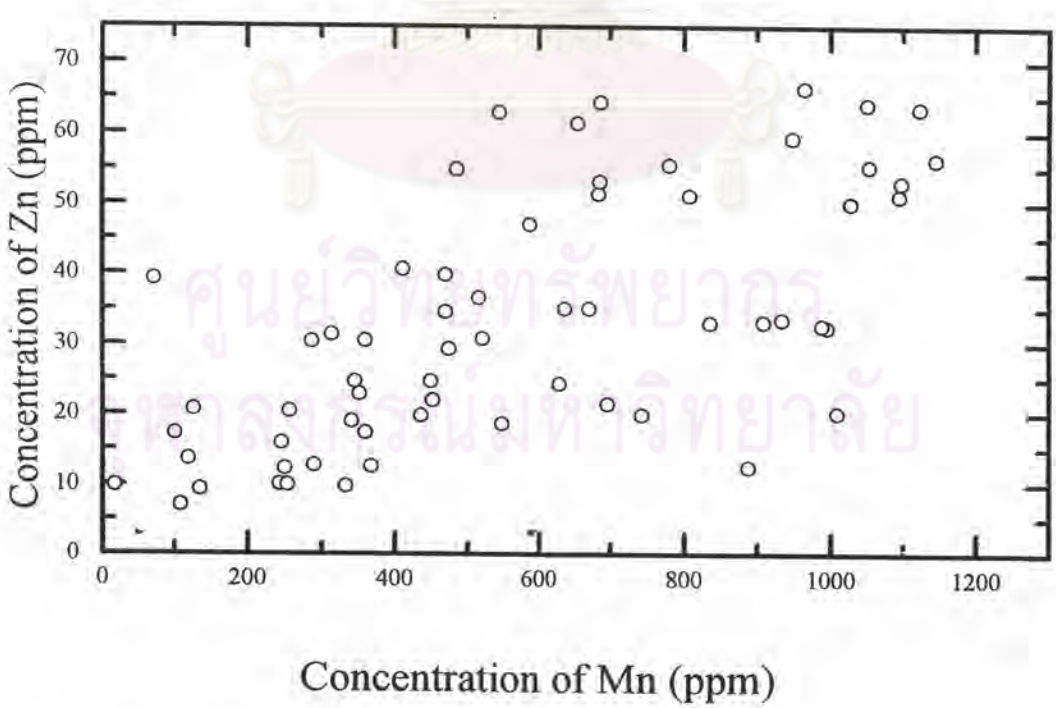

Figure C.10 Zn/Mn relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

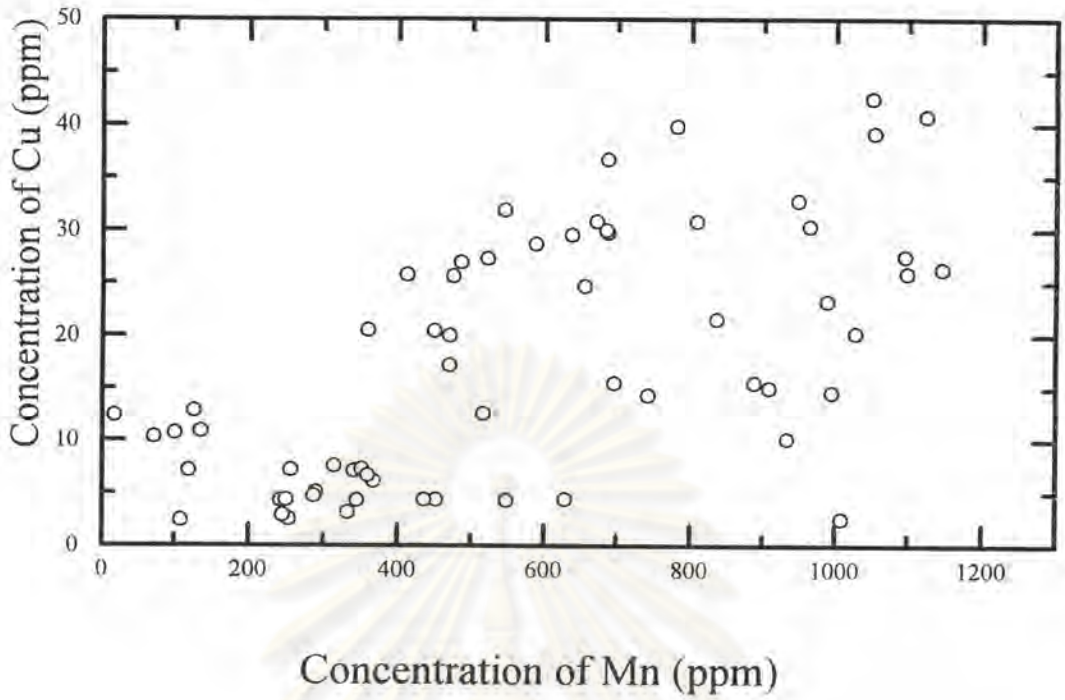

Figure C.11 Cu/Mn relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

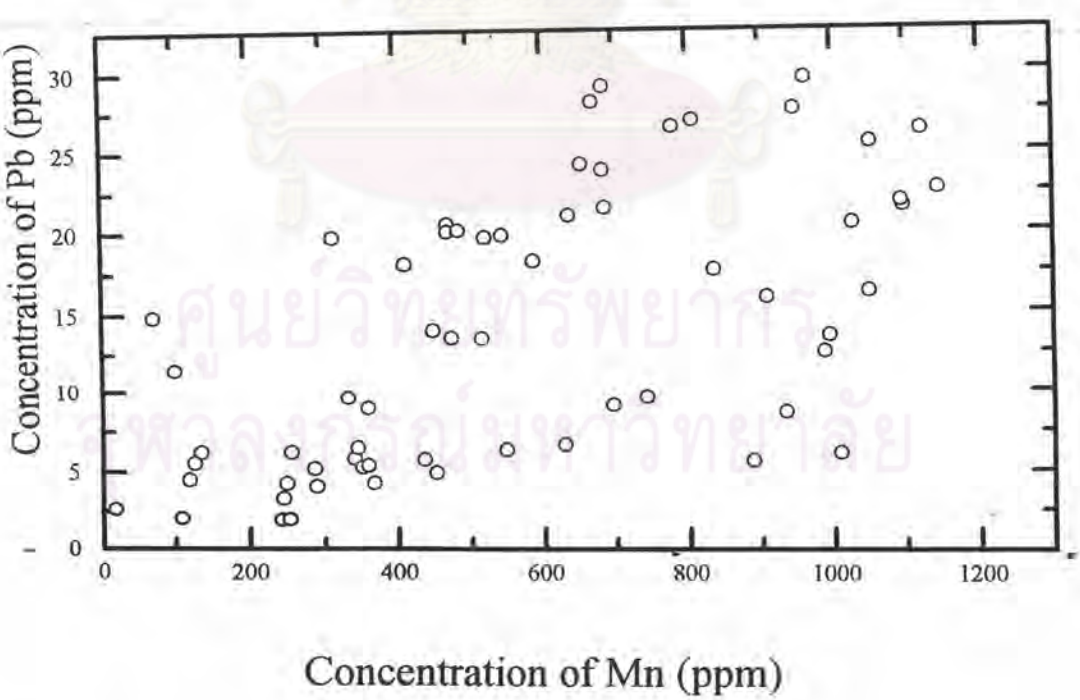

Figure C.12 Pb/Mn relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

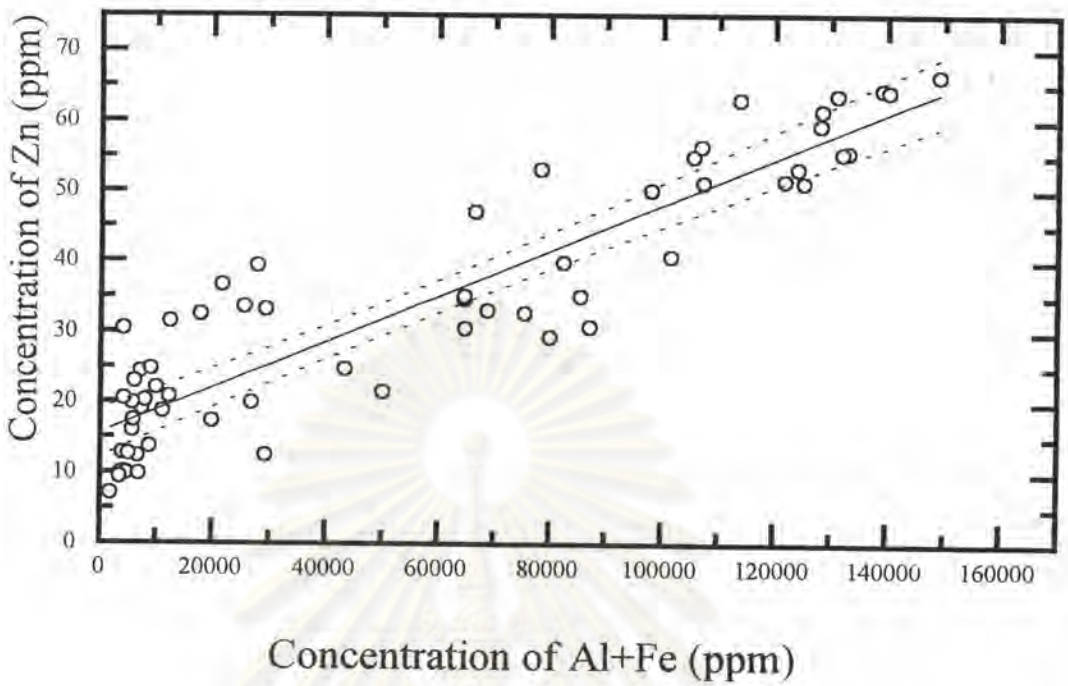

Figure C.13 Zn/Al+Fe relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

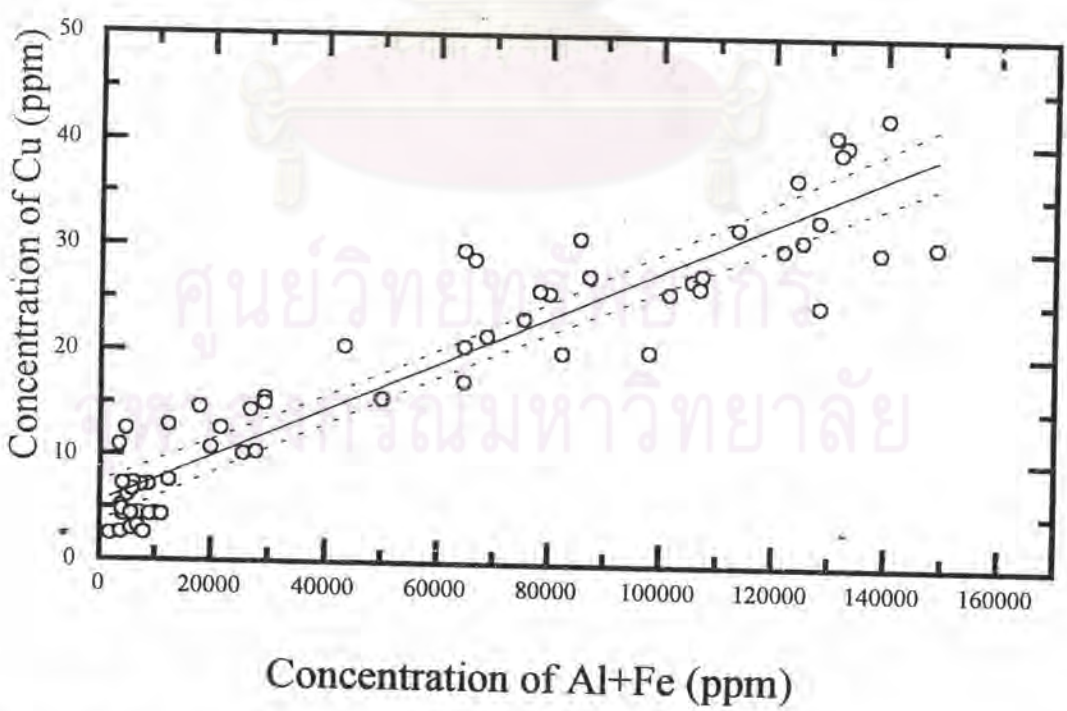

Figure C.14 Cu/Al+Fe relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

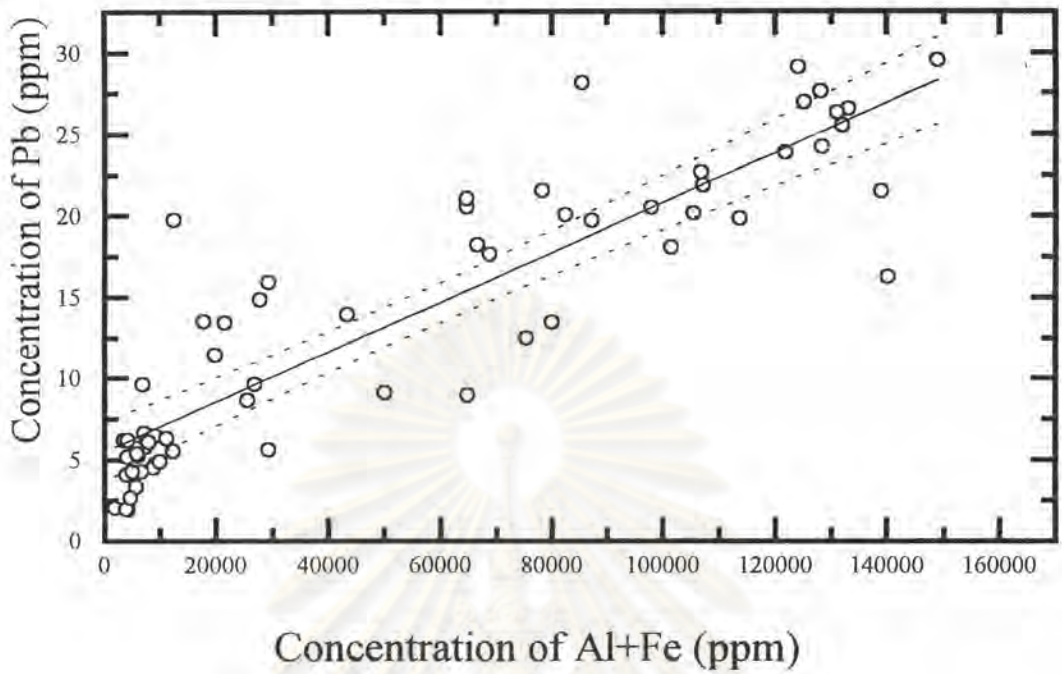

Figure C.15 Pb/Al+Fe relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

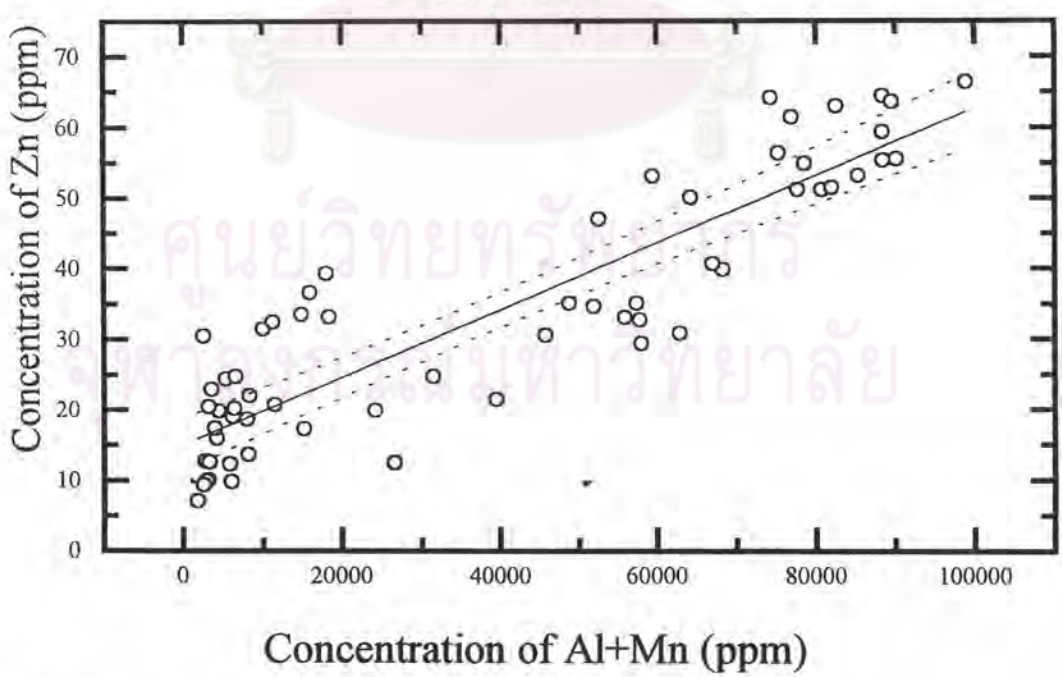

Figure C.16 Zn/Al+Mn relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

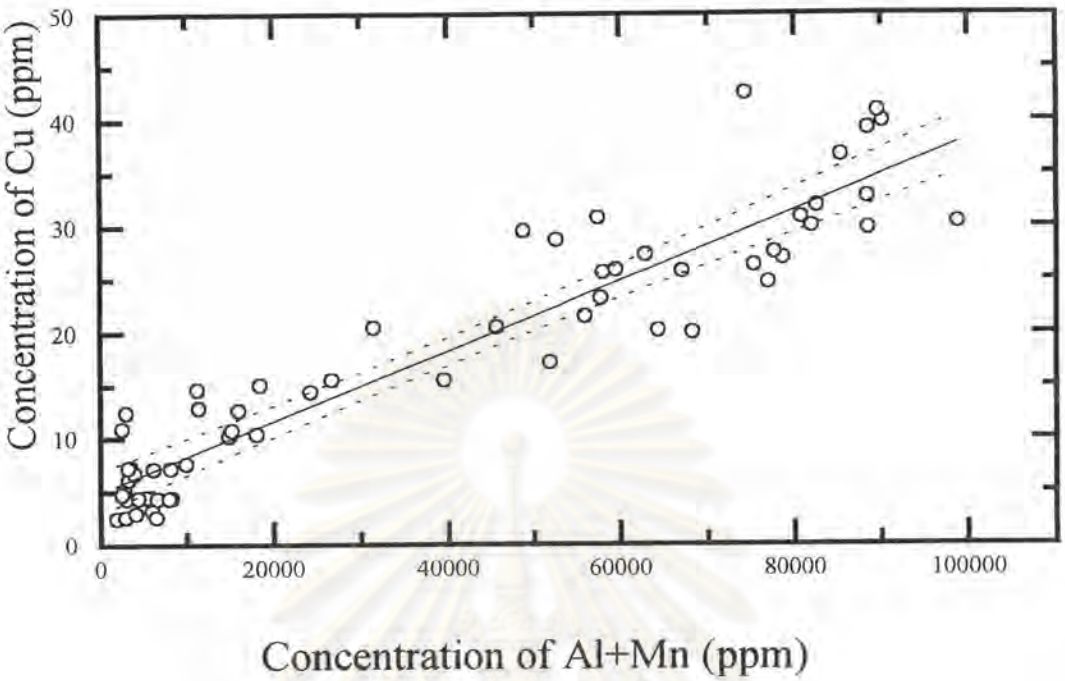

Figure C.17 Cu/Al+Mn relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

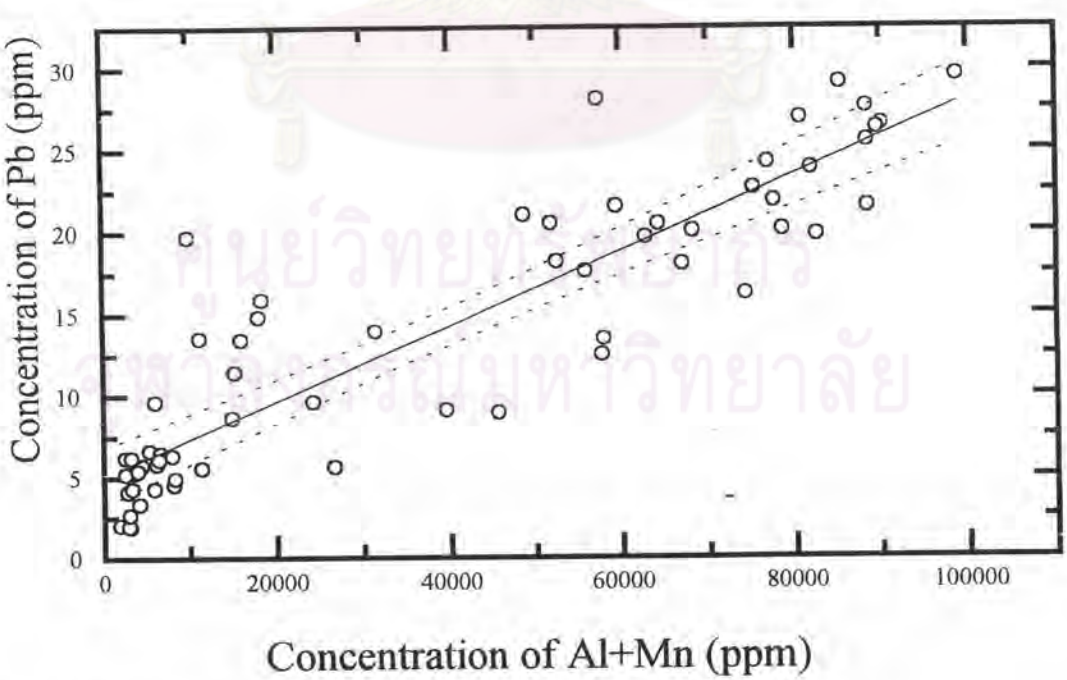

Figure C.18 Pb/Al+Mn relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

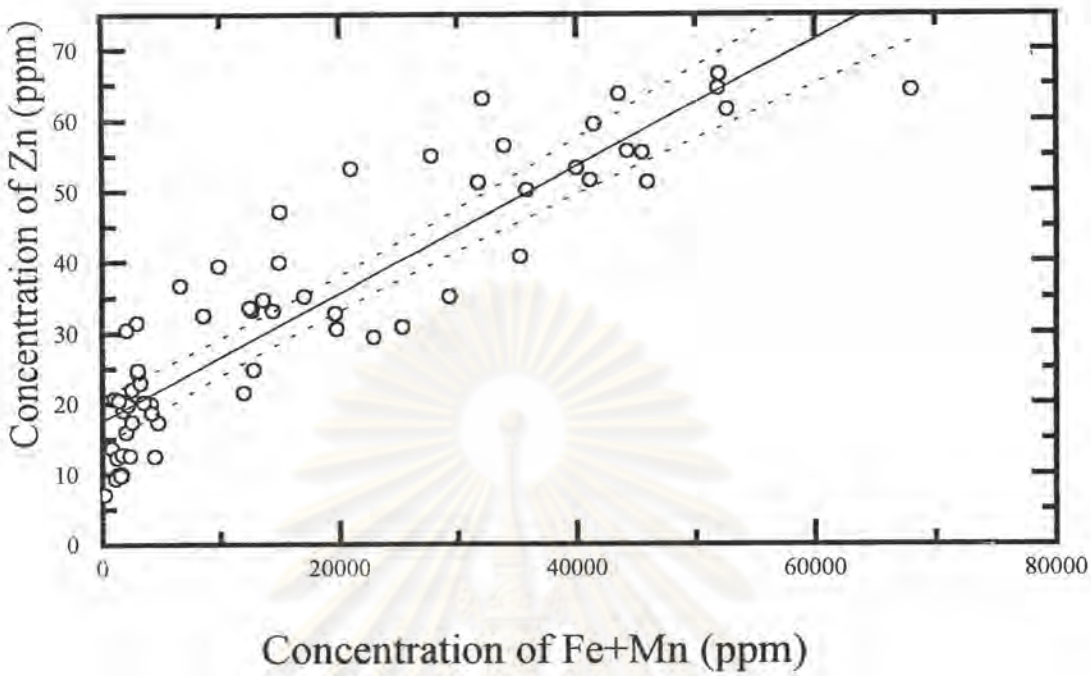

Figure C.19 Zn/Fe+Mn relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

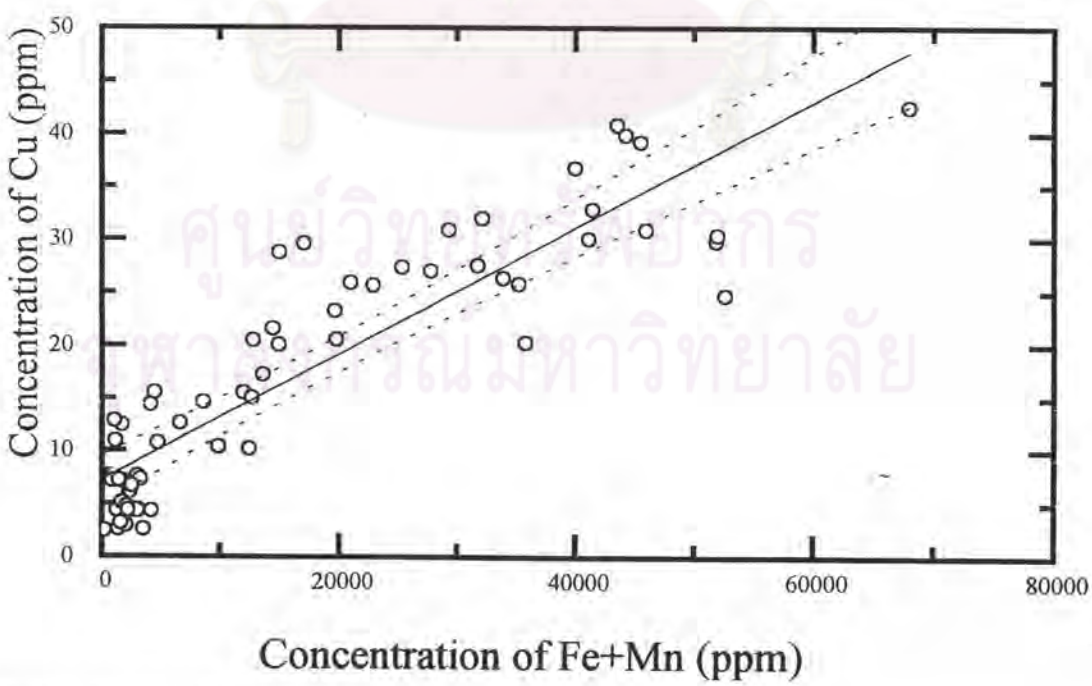

Figure C.20 Cu/Fe+Mn relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

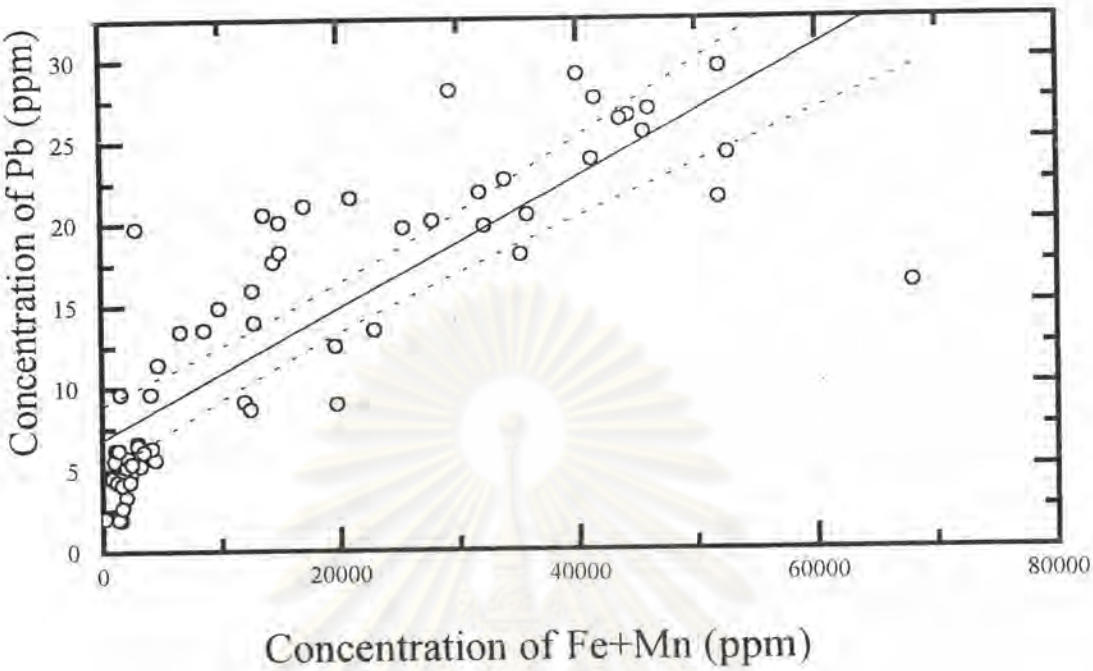

Figure C.21 Pb/Fe+Mn relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

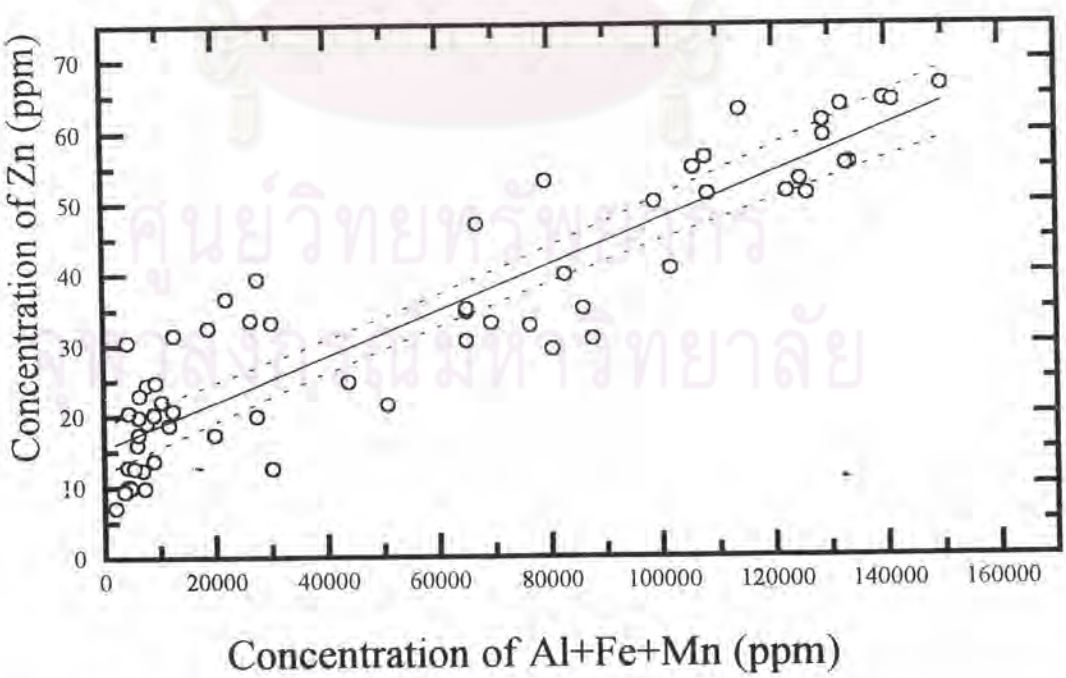

Figure C.22 Zn/Al+Fe+Mn relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

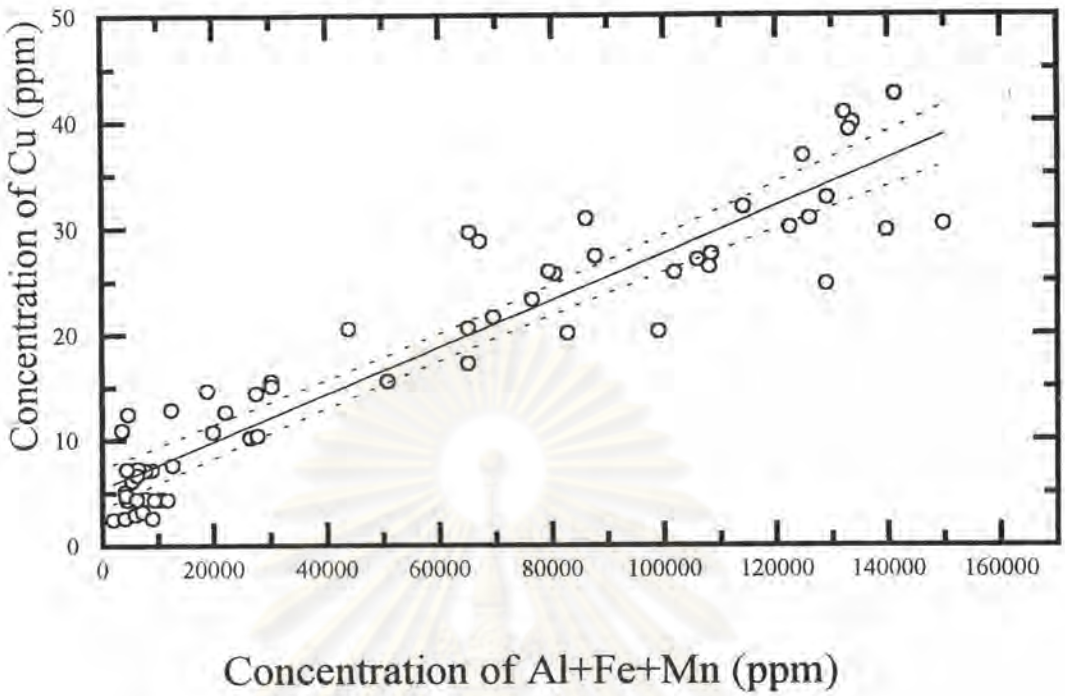

Figure C.23 Cu/Al+Fe+Mn relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

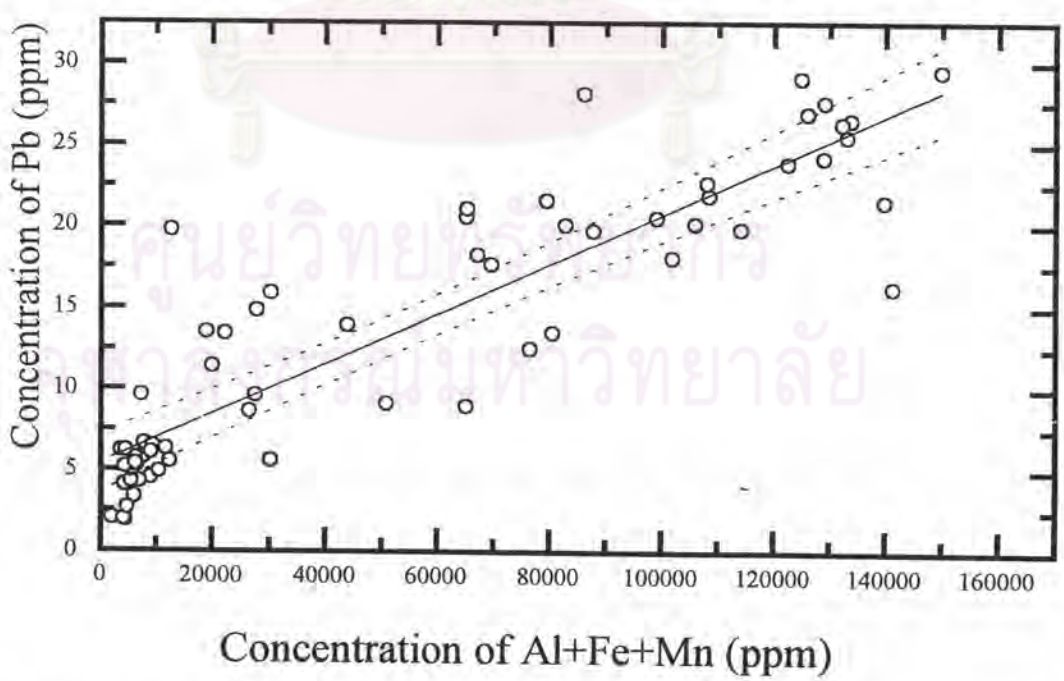

Figure C.24 Pb/Al+Fe+Mn relationship.
(The solid line represents the regression line while the 95% confidence limits are shown as dashed lines.)

BIOGRAPHY

Tunlawit Satapanajaru was born on October 16, 1971 in Bangkok. He received a Bachelor Degree of Science in 1992 from Department of Environmental Science, Faculty of Science and Technology, Thammasat University. He has continued his advanced study at Inter-Department of Environmental Science, Chulalongkorn University.