

Chapter IV

RESULTS

4.1 Limits of Detection

The detection limits of the ten elements under the irradiation and counting conditions of the present work were first studied. Standard solutions of various concentrations were subjected to irradiation followed by counting with the sequences given in Fig. 3-8. Since the activity increases linearly with increasing concentration; the concentration which begins to deviate from this general rule is considered as the limits of detection. Table 4-1 gives the minimum detectable concentrations of the ten elements under the working conditions of the present work.

Table 4-1 Minimum determinable concentrations of ten elements under the working conditions of the present work (ppb)

Element	Minimum determinable concentration
Al	5
Sr	2
Cu	2
Br	4
Mn	0.05
Cr	10
Sb	1
Sc	0.1
Fe	1000
Co	1

4.2 Results of the Quantitative Analysis

The results of the analysis of the 40 samples are given in Table 4-2 to Table 4-6. The results are from single determination. The imprecision of the method (high value of standard deviation) is mainly due to the errors involved in the counting statistics, on account of the low gamma-counting rate.

Table 4 - 2 Trace element concentrations (ppb). Samples collected on April 22, 1974

Element	Sample group 1 (Low tide)				Sample group 2 (High tide)			
	A	B	C	D	A	B	C	D
Al	58.46 [±] 9.90	41.11 [±] 9.10	41.10 [±] 2.67	34.81 [±] 2.61	46.11 [±] 13.28	64.22 [±] 18.41	35.94 [±] 2.65	35.24 [±] 2.82
Sr	65.48 [±] 16.77	50.61 [±] 13.04	58.18 [±] 16.45	63.64 [±] 26.54	45.56 [±] 9.54	69.02 [±] 16.98	67.86 [±] 18.36	44.03 [±] 8.42
Cu	43.13 [±] 1.69	37.92 [±] 1.73	29.44 [±] 1.45	39.51 [±] 1.75	55.3 [±] 2.12	51.87 [±] 2.11	42.37 [±] 1.91	42.97 [±] 1.52
Br	30.10 [±] 4.24	23.23 [±] 4.31	20.14 [±] 3.31	54.16 [±] 5.50	38.7 [±] 6.68	30.94 [±] 5.78	37.28 [±] 5.45	24.23 [±] 5.21
Mn	61.87 [±] 7.23	51.46 [±] 6.86	56.91 [±] 7.11	45.42 [±] 6.38	32.61 [±] 4.55	24.10 [±] 4.41	33.35 [±] 5.63	40.62 [±] 4.35
Cr	8.51 [±] 1.78	10.51 [±] 1.98	5.45 [±] 1.63	8.62 [±] 2.10	3.79 [±] 1.87	6.65 [±] 1.78	6.96 [±] 2.15	5.56 [±] 2.10
Sb	0.97 [±] 0.17	0.72 [±] 0.17	0.71 [±] 0.15	0.85 [±] 0.16	0.66 [±] 0.38	0.73 [±] 0.31	1.38 [±] 0.40	1.64 [±] 0.41
Sc	0.04 [±] 0.006	0.07 [±] 0.007	0.04 [±] 0.005	0.07 [±] 0.007	0.04 [±] 0.007	0.05 [±] 0.007	0.05 [±] 0.007	0.07 [±] 0.007
Fe	68.55 [±] 19.4	119.5 [±] 32.1	43.4 [±] 15	88.45 [±] 27.85	65.6 [±] 37.75	60.9 [±] 34.2	89.75 [±] 35.7	100 [±] 40.7
Co	0.45 [±] 0.07	0.53 [±] 0.08	0.20 [±] 0.07	0.23 [±] 0.07	0.83 [±] 0.26	0.56 [±] 0.25	0.56 [±] 0.26	0.51 [±] 0.26

A = Samut Prakan

B = Bangkok Bridge (Bangkok)

C = Ban Sai Ma (Nonthaburi)

D = Nonthaburi Bridge (Pathum Thani)

Table 4 - 3 Trace element concentrations (ppb). Samples collected on June 5, 1974

Element	Sample group 3 (Low tide)				Sample group 4 (High tide)			
	A	B	C	D	A	B	C	D
Al	34.6 ± 3.71	38.04 ± 4.39	33.69 ± 3.10	32.89 ± 3.26	53.71 ± 5.31	46.47 ± 4.92	43.55 ± 3.1	44.19 ± 3.37
Sr	171.55 ± 66.29	34.5 ± 7.5	15.92 ± 3.66	50.1 ± 13.93	24.64 ± 6.3	10.18 ± 3.59	55.21 ± 18.72	58.9 ± 23.26
Cu	128.74 ± 5.12	36.17 ± 1.33	14.43 ± 0.71	89.52 ± 2.93	17.76 ± 0.86	6.18 ± 0.62	72.47 ± 2.7	34.96 ± 1.4
Br	28.85 ± 11.03	23.17 ± 4.45	21.9 ± 2.5	34.02 ± 4.73	42.32 ± 4.0	37.82 ± 3.41	29.84 ± 7.12	23.32 ± 3.26
Mn	84.16 ± 28.27	38.6 ± 6.45	39.39 ± 5.95	75.23 ± 12.55	17.32 ± 3.37	12.14 ± 2.8	81.41 ± 22.22	21.65 ± 2.44
Cr	2.10 ± 0.48	3.64 ± 0.62	1.36 ± 0.34	1.72 ± 0.49	4.52 ± 1.46	6.16 ± 1.63	2.9 ± 0.60	4.28 ± 1.19
Sb	0.27 ± 0.06	0.16 ± 0.07	0.26 ± 0.07	0.32 ± 0.08	2.31 ± 0.54	1.28 ± 0.47	0.76 ± 0.39	0.91 ± 0.35
Sc	0.02 ± 0.002	0.02 ± 0.003	0.01 ± 0.002	0.04 ± 0.004	0.03 ± 0.007	0.04 ± 0.007	0.03 ± 0.006	0.06 ± 0.00
Fe	37.95 ± 12.2	20.95 ± 7.6	21.8 ± 5.60	50.5 ± 11.6	71.65 ± 41.7	58.35 ± 34.55	65.5 ± 40.0	79.3 ± 46.45
Co	0.09 ± 0.03	0.16 ± 0.04	0.10 ± 0.04	0.16 ± 0.04	0.66 ± 0.25	1.0 ± 0.28	0.75 ± 0.27	0.89 ± 0.24

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Table 4 - 4 Trace element concentrations (ppb). Samples collected on June 18, 1974

Element	Sample group 5 (Low tide)				Sample group 6 (High tide)			
	A	B	C	D	A	B	C	D
Al	45.63 [±] 11.25	34.51 [±] 9.32	36.78 [±] 4.66	38.86 [±] 5.40	35.10 [±] 8.35	31.81 [±] 8.67	33.66 [±] 4.76	38.66 [±] 5.
Sr	31.38 [±] 6.59	22.61 [±] 7.66	18.77 [±] 5.10	19.72 [±] 5.17	28.1 [±] 7.99	31.33 [±] 6.48	49.17 [±] 13.38	22.1 [±] 4.
Cu	32.44 [±] 1.34	19.89 [±] 1.29	17.41 [±] 0.96	12.47 [±] 0.94	24.43 [±] 1.35	31.34 [±] 1.43	27.76 [±] 1.40	12.88 [±] 0.
Br	33.99 [±] 5.31	48.39 [±] 3.83	30.1 [±] 3.61	22.65 [±] 2.97	165.42 [±] 9.71	148.94 [±] 8.70	43.69 [±] 4.55	26.61 [±] 2.
Mn	126.23 [±] 16.96	19.46 [±] 7.24	11.51 [±] 1.60	10.68 [±] 2.35	30.45 [±] 11.41	19.21 [±] 5.82	30.92 [±] 6.70	36.41 [±] 6.
Cr	5.10 [±] 1.13	4.92 [±] 0.92	6.50 [±] 1.04	5.2 [±] 0.96	8.9 [±] 4.40	3.40 [±] 2.66	7.97 [±] 2.55	5.91 [±] 2.
Sb	0.36 [±] 0.08	0.25 [±] 0.06	0.22 [±] 0.07	0.30 [±] 0.07	1.23 [±] 0.20	0.43 [±] 0.13	0.52 [±] 0.14	0.81 [±] 0.
Sc	0.05 [±] 0.005	0.05 [±] 0.005	0.07 [±] 0.006	0.07 [±] 0.006	0.04 [±] 0.006	0.05 [±] 0.005	0.05 [±] 0.006	0.18 [±] 0.
Fe	25.10 [±] 5.75	33.5 [±] 6.45	66.9 [±] 12.6	39.2 [±] 7.9	34.45 [±] 13.3	77.1 [±] 24.15	93.55 [±] 34.2	190.0 [±] 67.
Co	0.21 [±] 0.05	0.15 [±] 0.04	0.18 [±] 0.04	0.09 [±] 0.04	0.09 [±] 0.05	0.16 [±] 0.05	1.08 [±] 0.08	0.21 [±] 0.

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Table 4 - 5 Trace element concentrations (ppb). Samples collected on August 18, 1974

Element	Sample group 7 (Low tide)				Sample group 8 (High tide)			
	A	B	C	D	A	B	C	D
Al	29.73 [±] 1.99	28.19 [±] 2.14	36.2 [±] 2.38	33.86 [±] 2.5	18.66 [±] 4.61	55.2 [±] 14.25	26.65 [±] 2.14	25.82 [±] 2.42
Sr	29.12 [±] 7.82	31.5 [±] 6.13	21.47 [±] 4.01	21.0 [±] 6.42	56.26 [±] 20.2	79.89 [±] 26.61	43.13 [±] 11.22	28.29 [±] 8.11
Cu	26.31 [±] 1.36	19.23 [±] 0.94	39.85 [±] 1.05	16.51 [±] 0.88	41.17 [±] 2.2	93.02 [±] 4.04	50.45 [±] 2.15	24.24 [±] 1.12
Br	28.94 [±] 3.87	52.15 [±] 5.1	36.42 [±] 3.95	13.75 [±] 3.12	128.82 [±] 8.67	130.38 [±] 11.42	28.1 [±] 4.51	31.22 [±] 3.10
Mn	65.46 [±] 8.5	16.89 [±] 3.68	42.52 [±] 5.13	13.32 [±] 3.8	60.01 [±] 11.64	114.83 [±] 25.82	57.43 [±] 7.84	46.0 [±] 5.36
Cr	4.20 [±] 2.01	2.98 [±] 0.98	3.86 [±] 1.23	3.46 [±] 1.18	6.02 [±] 1.17	3.85 [±] 1.04	5.36 [±] 0.98	5.34 [±] 0.92
Sb	0.42 [±] 0.11	0.32 [±] 0.08	0.32 [±] 0.09	0.44 [±] 0.09	0.34 [±] 0.09	0.20 [±] 0.08	0.37 [±] 0.09	0.47 [±] 0.08
Sc	0.03 [±] 0.005	0.06 [±] 0.006	0.07 [±] 0.006	0.06 [±] 0.006	0.07 [±] 0.006	0.04 [±] 0.005	0.06 [±] 0.006	0.07 [±] 0.006
Fe	35.55 [±] 19.6	53.3 [±] 27.75	65.5 [±] 29.4	23.0 [±] 12.3	39.9 [±] 9.8	68.0 [±] 15.6	68.3 [±] 17.1	50.6 [±] 13.1
Co	0.23 [±] 0.05	0.17 [±] 0.04	0.12 [±] 0.05	0.18 [±] 0.04	0.21 [±] 0.04	0.19 [±] 0.05	0.13 [±] 0.06	0.16 [±] 0.04

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Table 4 - 6 Trace element concentrations (ppb). Samples collected on August 24, 1974

Element	Sample group 9 (Low tide)				Sample group 10 (High tide)			
	A	B	C	D	A	B	C	D
Al	21.03 [±] 3.92	28.4 [±] 6.8	6.11 [±] 1.06	13.14 [±] 2.33	10.5 [±] 1.60	12.14 [±] 2.19	11.47 [±] 1.67	9.96 [±] 1.83
Sr	45.14 [±] 7.28	49.26 [±] 11.6	26.79 [±] 4.93	60.23 [±] 12.76	38.0 [±] 8.40	25.62 [±] 5.87	29.2 [±] 7.8	45.91 [±] 13.64
Cu	59.63 [±] 1.91	49.56 [±] 2.03	10.55 [±] 0.23	16.53 [±] 0.77	61.57 [±] 1.89	38.68 [±] 1.4	19.41 [±] 1.02	34.83 [±] 1.46
Br	19.86 [±] 3.83	25.36 [±] 4.76	18.65 [±] 2.18	42.99 [±] 4.5	44.7 [±] 7.10	42.1 [±] 4.41	28.65 [±] 2.86	23.41 [±] 3.67
Mn	33.8 [±] 7.10	41.74 [±] 7.41	32.44 [±] 4.9	97.19 [±] 13.1	39.51 [±] 7.10	38.79 [±] 7.4	52.1 [±] 11.33	31.23 [±] 7.21
Cr	2.15 [±] 0.68	1.72 [±] 0.60	2.0 [±] 0.60	1.71 [±] 0.62	4.44 [±] 1.67	5.64 [±] 1.41	2.9 [±] 1.32	3.78 [±] 1.33
Sb	0.20 [±] 0.06	0.18 [±] 0.05	0.08 [±] 0.04	0.16 [±] 0.04	0.81 [±] 0.11	0.40 [±] 0.09	0.27 [±] 0.08	0.25 [±] 0.08
Sc	0.02 [±] 0.003	0.02 [±] 0.003	0.02 [±] 0.003	0.03 [±] 0.003	0.04 [±] 0.006	0.05 [±] 0.005	0.07 [±] 0.006	0.04 [±] 0.005
Fe	8.6 [±] 3.25	10.78 [±] 3.25	8.45 [±] 3.2	15.8 [±] 5.10	34.15 [±] 17.25	60.35 [±] 27.9	42.8 [±] 18.6	47.8 [±] 19.9
Co	0.08 [±] 0.03	0.08 [±] 0.03	0.08 [±] 0.03	0.11 [±] 0.04	0.17 [±] 0.04	0.12 [±] 0.04	0.12 [±] 0.04	0.09 [±] 0.04

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