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APPENDIX A

Analytical Techniques

Determination of Major Elements and Some Trace Elements

Most of major elements and some trace elements were determined by Mr. Somsak Sangsila, Mrs. Suchada Sripairojthikoon, Miss Sasithon Panthong, and Miss Piyanun Amnachsakullit, the staffs of Mineral Resources Analysis Division, DMR. X-ray fluorescence (XRF) technique was mainly used for analysing major elements and some trace elements, comprising SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, Na_2O, K_2O, TiO_2, MnO, P_2O_5, Ba, Ce, Co, Cr, Nb, Ni, Pb, Rb, Sr, V, Y, Zn, and Zr. The main procedure is present as following :

1. Individual powdery samples were roasted at 105 °C about 3 hr and allow to cool to room temperature for longer than 24 hrs.

2. 1.3 gm of each sample and reference standard were roasted at 105 °C about 1 to 2 hrs for calculating H2O- content, that was determined by loss on weight.

3. These samples and standards were burned at about 950 to 1,050 °C about half hour for calculating the ignition loss, which was still determined by loss of weight.

4. About 6.5 gm of flux spectromelt "A12" (66:34 ratio of LiBO2 : Li2B4O7) and 0.05 gm of I2O5 were mixed into samples and standards. These mixers were fused at about 1,200 °C for 25 minutes.

5. The homogeneous pellets are prepared and always stored in the desiccator before X-ray fluorescence analysis.

6. X-ray spectrometer of Philips (model PW 1400) with Rh tube was used to analyse major elements and some trace elements by wave range dispersive method. The

Table A1 Condition of XRF method for major element analysis (after Sangsila, 1990).

Element	Line	Analysing Crystal	2θ Angle	Detector	Time (sec.)
Si	K	PET	109.21	Flow	20
Al	K	PET	145.11	Flow	20
Fe	K	Li F 200	57.52	Flow	10
Ca	K	Li F 200	113.09	Flow	10
Mg	K	TLAP	45.17	Flow	20
Na	K	TLAP	55.10	Flow	20
K	K	Li F 200	136.76	Flow	10
Ti	K	Li F 200	86.14	Flow	10
Mn	K	Li F 200	62.94	Flow	10
P	K	GE	141.04	Flow	20

analytical conditions of some elements were concluded in Table A1.

7. Most data were determined by the detector and relatively computerized by the computer system. Then final data are reported after these processings.

Determination of Rare Earth Elements (REE)

Neutron activation analysis (NAA) technique was used to determined some rare earth elements, containing La, Ce, Nd, Sm, Eu, Tb, Dy, Yb, and Lu. These rare earth elements were analyzed by Mr. Chanchai Asvavijnijkulchai, Physics Division, Office of Atomic Energy for Peace. The procedure of this analysis in an orderly sequence is shown below.

1. Weight app. 100 mg of a homogeneous powder of each sample, basalt standard of U. S. G. S. (BHVO-1), and geological material standard (SOIL-7) were weighed and put into new small polyethylene vials.

2. These vials were packed, and were composed of 2 samples with 1 standard (SOIL-7) , or 2 basalt standard (BHVO-1) with 1 standard (SOIL-7). The standard vial was always inserted between 2 samples and 2 basalts standard. The packages of basalt standard were prepared for accuracy testing.

3. About 3 packages were put into a clean polyethylene rabbit. The samples and standard in rabbits were activated together at the suitable epithermal neutron flux in a covered tube. The times for activation of each elements are concluded in Table A2.

4. The samples and standard were determined element by element by the detector system, that commonly comprises detector, preamplifier, amplifier, multichannel analyzer, printer, plotter, etc. The details of detection are concluded in Table A2.

5. Most corrected data would be computerized by the p.c. computer. Then final data would be present after these processing.

Table A2 Conditions of NAA technique for REE analysis (modified after Asvavijnijkulchai, 1986)

Element	Time for Activation	Decedent Time	Isotope	Detected Time	Distance from Detector	Energy (KeV)
Dy	5 min	30 min	Dy-165	600 sec	7 cm	94.60
Eu	5 min	30 min	Eu-152	600 sec	7 cm	121.80
Sm	15 hrs	5 days	Sm-153	600 sec	7 cm	103.20
La	15 hrs	5 days	La-140	600 sec	7 cm	159.60
Nd	40 hrs	15-25 days	Nd-147	2160 sec	0 cm	91.10
Ce	40 hrs	15-25 days	Ce-141	2160 sec	0 cm	145.50
Yb	40 hrs	15-25 days	Yb-169	2160 sec	0 cm	177.0,197
Lu	40 hrs	15-25 days	Lu-177	2160 sec	0 cm	208.30
Tb	40 hrs	15-25 days	Tb-160	2160 sec	0 cm	298.50

APPENDIX B

List of Analytical Samples

Sop Prap-Ko Kha Basalts

Sample number	Grid reference	Remark
S-2	406947	the fifth flow
S-4	406947	the fourTh. flow
S-8	406947	the third flow
S-11	406947	the second flow
S-13	406947	the first flow
S1-1	387942	the fifth flow
S1-7	387942	the fourth flow
S1-10	386937	the third flow
S1-13-2	385935	the second flow
S1-14	385935	the first flow
S7-2	398941	the fifth flow
S7-3-1	398941	the fourth flow
S7-5	394938	the third flow
S8-2	393937	the second flow
S8-5	393937	the first flow
S18-2-1	411946	the fifth flow

Sample number	Grid reference	Remark
S18-3	410945	the fourth flow
S18-5-2	414946	the third flow
S18-7	419946	the second flow
S18-11	423945	the first flow
S19-1	408948	the fifth flow
S19-3	408948	the fourth flow
S19-5	410950	the third flow
S19-7	411952	the second flow
S19-9	415956	the first flow
S21-1	405949	the fifth flow
S21-4-2	406952	the fourth flow
S21-6	409956	the third flow
S21-8	410957	the second flow
S21-10	412959	the first flow
S24-1	402950	the fifth flow
S24-2	401951	the fourth flow
S24-4	399953	the third flow
S24-6	397956	the second flow
S24-7	396958	the first flow
S29-1	410941	the fifth flow
S29-3	412940	the fourth flow
S29-5	415940	the third flow
S29-10	422942	the second flow
S29-11	424942	the first flow

Sample number	Grid reference	Remark
S2-2	383938	the fifth flow
S13-1	375920	the fourth flow
S6-2	360916	the third flow
S14-7	404925	the second flow
S12-6	376927	the first flow
S20-2	392947	the fifth flow
S14-1	402937	the fourth flow
S22-4-1	395950	the third flow
S25-4	396961	the second flow
S23-4-1	393961	the first flow
S28-1	419931	the fifth flow
S25-1	402958	the fourth flow
S28-3	422936	the third flow
S28-4	424938	the second flow
S27-11	385901	the first flow

Nam Cho Basalts

Sample number	Grid reference	Remark
N-1	477035	
N-2	477034	
N-3	477034	
N-5	477033	
N-6	476031	
N-7	475031	
N-8	474031	
N-9	474030	
N-10	474030	
N-11	473030	
N-12	472030	

APPENDIX C

XRD Patterns of Mineral Occurrences from Pittings, Megacrysts and Ultramafic Nodules of Basalts from the Nam Cho Area and the Sop Prab-Ko Kha Area

Fig. C

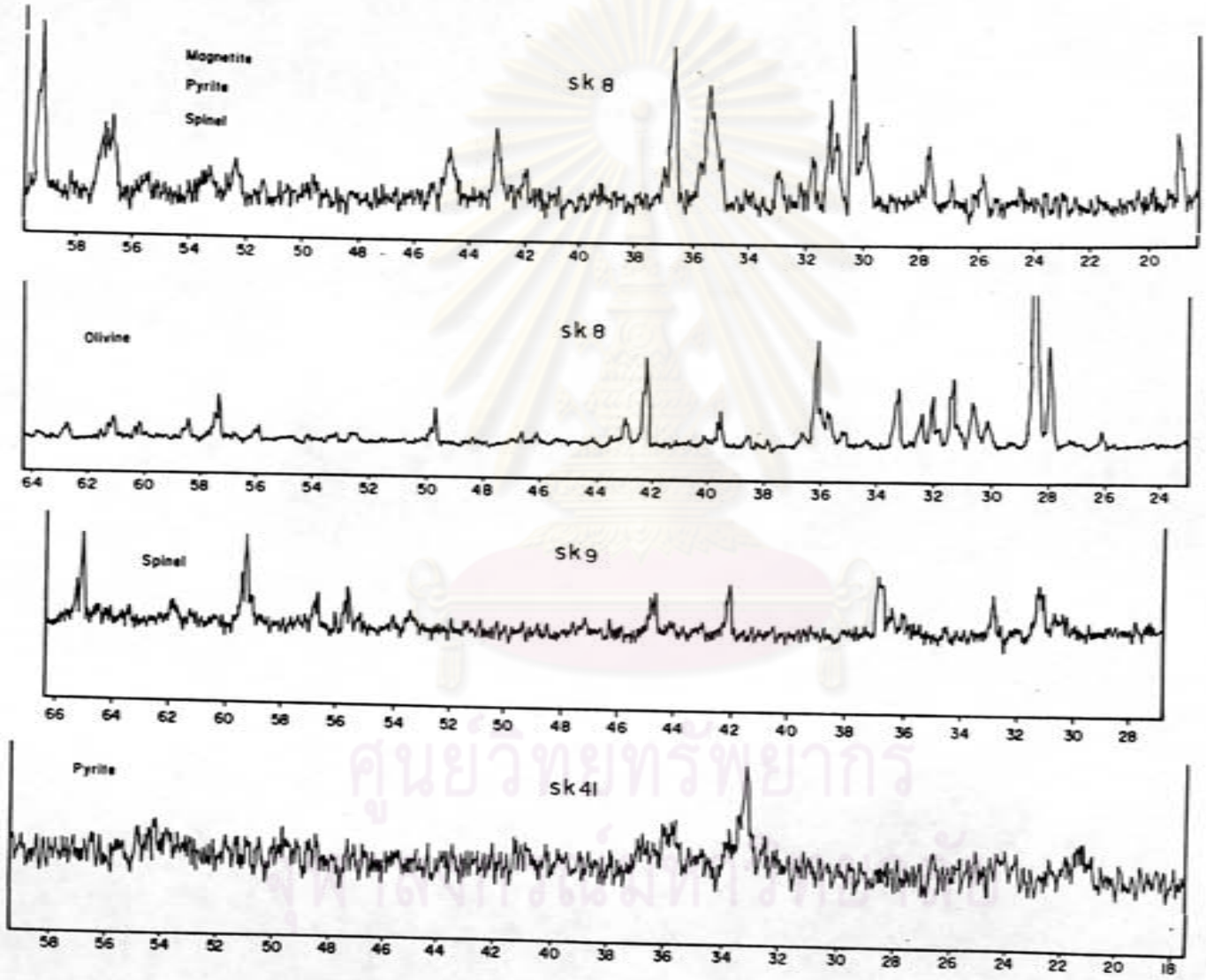


Fig. C (cont.)

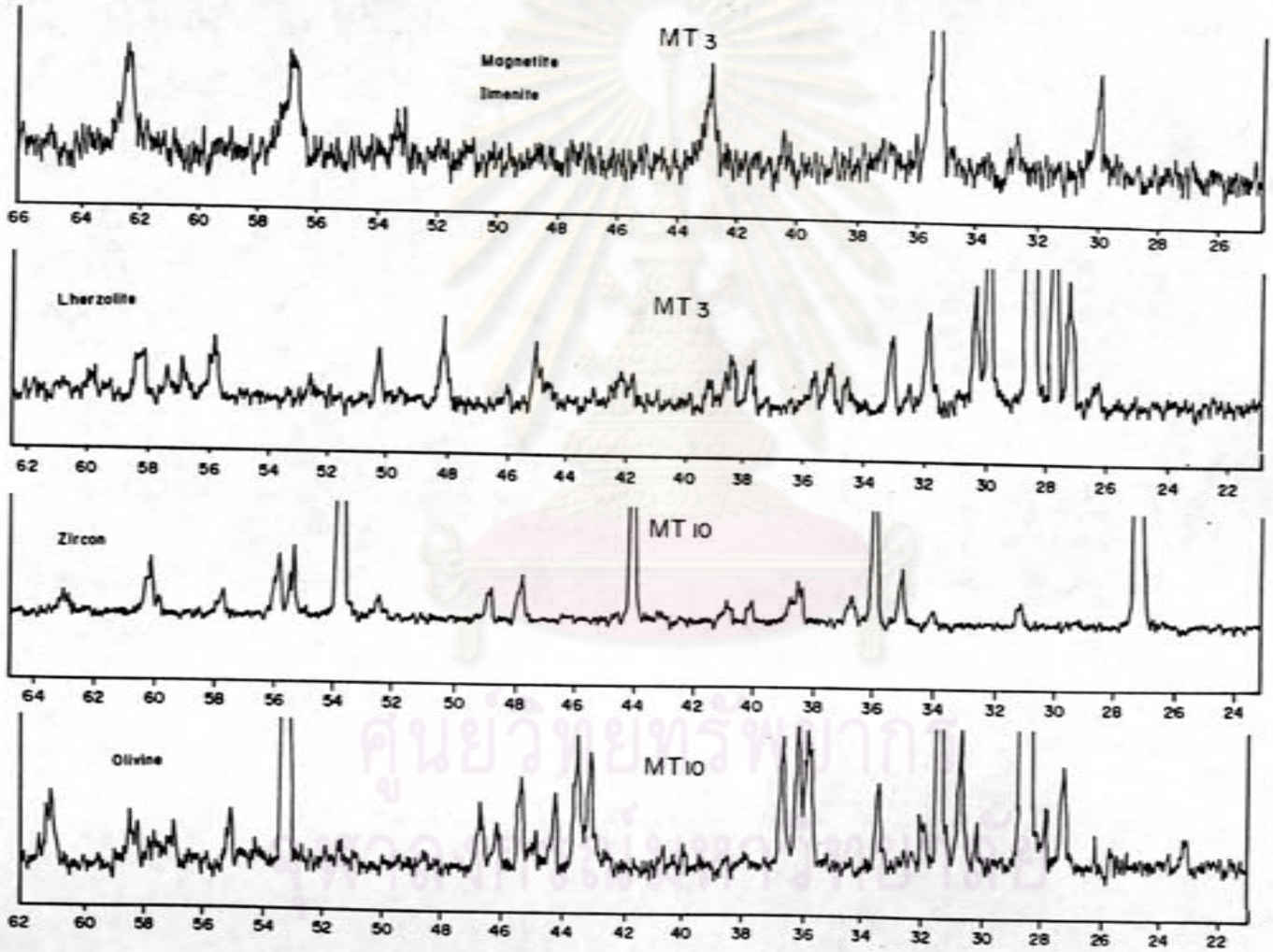
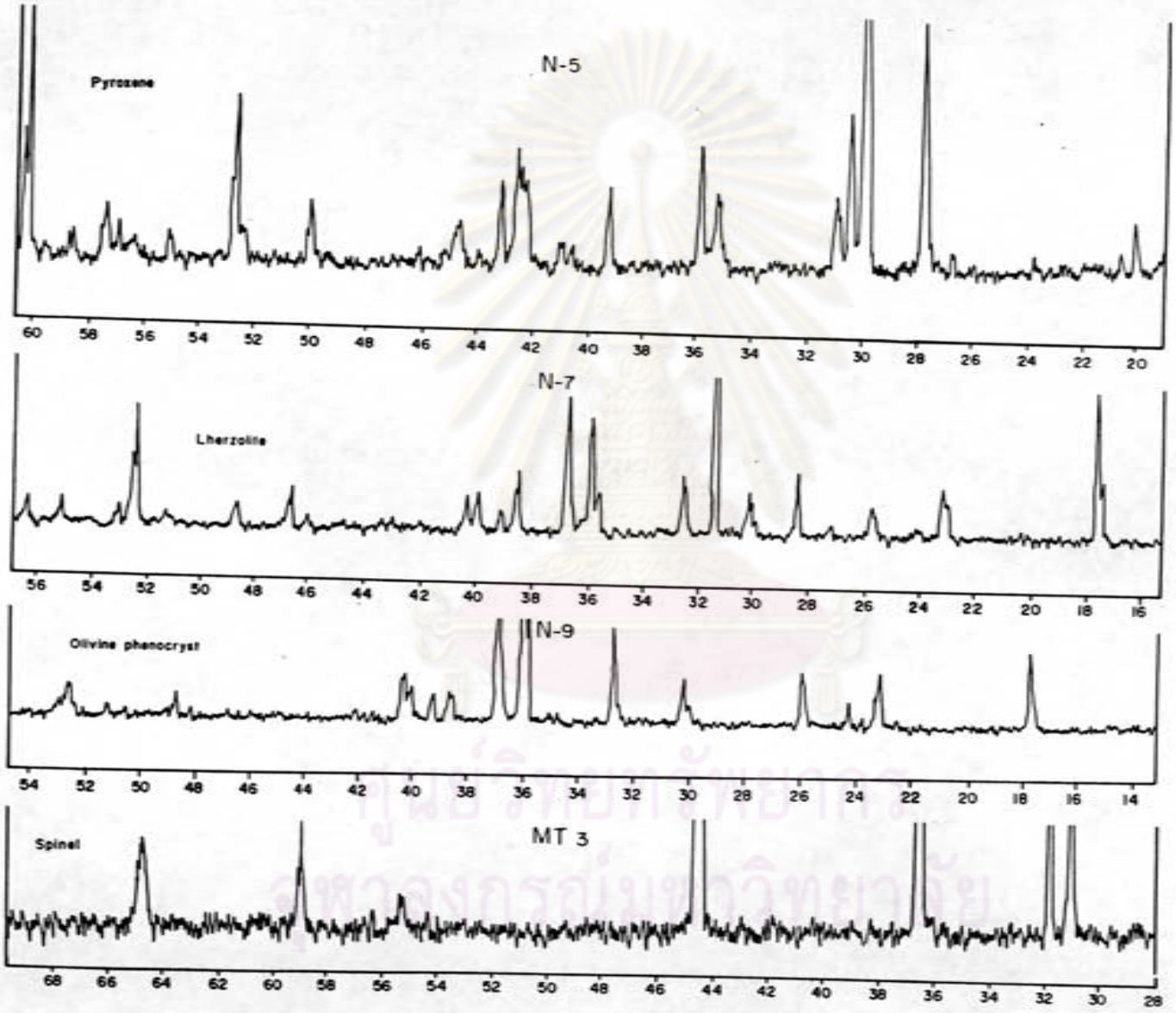

MT 3
Magnetite
Ilmenite
66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30 28 26
Lherzolite
MT 3
62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30 28 26 24 22
Zircon
MT 10
64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30 28 26 24
Olivine
MT 10
62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30 28 26 24 22

Fig. C (cont.)


Pyroxene
N-5
60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30 28 26 24 22 20
Lherzolite
N-7
56 54 52 50 48 46 44 42 40 38 36 34 32 30 28 26 24 22 20 18 16
Olivine phenocryst
N-9
54 52 50 48 46 44 42 40 38 36 34 32 30 28 26 24 22 20 18 16 14
Spinel
MT 3
68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30 28

BIOGRAPHY

Mr. Chakkaphan Sutthirat was born in Bangkok, on October 25, 1970. He has finished in B. Sc. (Geology) program from Department of Geology, Chulalongkorn University, since 1992. After graduation, he studied the M. Sc. program in geology at Graduate School, Chulalongkorn University. In 1993, he has started his first work at Gemstone Exploration Section, Economic Geology Division, Department of Mineral Resources.