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# APPENDICES

# APPENDIX A.1

## GEOCHEMISTRY

Totally, 22 rock samples have been selected for geochemical analysis. They are 1 sample representative sample of Permian limestone, 2 specimens of Triassic rock (Sai Bon formation), 4 samples of Khlong Min formation, 2 samples of Lam Thap formation, 1 sample of Phun Phin formation, and 1 sample of volcanic rock were determined by the wet analysis using the classical method for major elements and atomic absorption spectrometer for trace elements, $P_2O_5$ was determined by UV-visible spectrophotometer. The geochemical analysis has been undertaken by the Mineral Resource Analysis Division, Department of Mineral Resources.

The 3 rock samples were determined by X-ray diffractometry for mineral compositions.

1. Major elements

The chemical compositions are shown in Table A.1 and Figure A.1. Detailed of these major elements characteristics are shown as follows;

$SiO_2$ values of the Permian limestone is 0.54% , the Sai Bon formation ranges from 2.41 to 3.01%(average 2.71%), the Khlong Min formation ranges from 3.25 to 5.52 %(average 4.39%) for lithofacies I, 46.58 to 54.04%(average 50.31%) for lithofacies III, the Lam Thap formation range from 64.6 to 75.2%(average 69.93%), 84.11% for the Phun Phin formation, and 75.94% for volcanic rock of Khuan Nok Wa, Ban Nau Khlong map sheet (4825 III).

$Al_2O_3$ contents 0.15% for Permian limestone, 1.07 to 1.42%(average 1.24%) for the Sai Bon formation, 2.98 to 4.41%(average 3.69%) for lithofacies I and 1.33 to

3.43%(average 2.38%) for lithofacies III of the Khlong Min formation, the Lam Thap formation ranges from 16.91 to 17.26%(average 17.09%), 7.21% for Phun Phin formation, and 4.63% for valcanic rock.

$Fe_2O_3$ values of Permian limestone is 0.08%, 0.14 to 0.36%(average 0.25%) for the Sai Bon formation, 1.53 to 1.68%(average 1.61%) for lithofacies III, and 0.81 to 1.91%(average 1.36%) for lithofacies I of the Khlong Min formation, 1.49 to 4.66%(average 3.08%) for the Lam Thap formation, 2.79% for the Phun Phin formation, and 1.7% for volcanic rock.

$P_2O_5$ contents 0.004% for Permian rock, 0.009 to 0.015%(average 0.012%) for the Sai Bon formation, and the Khlong Min formation ranges from 0.076 to 0.111%(average 0.094%).

MgO values of Permian limestone is 0.49%, 0.4 to 0.82%(average 0.61%) for the Sai Bon formation, 0.8 to 0.81%(average 0.805%) for lithofacies I and 0.88 to 2.14%(average 1.50%) for lithofacies III of the Khlong Min formation, 0.1 to 0.41%(average 0.26%) for the Lam Thap formation, 0.22% for the Phun Phin formation, and 1.18 % for volcanic rock.

CaO values 54.87 for Permian limestone, 52.19 to 53.04%(average 52.62%) for the Sai Bon formation, 48.35 to 49.90%(average 49.17%) for lithofacies I and 22.28 to 24.55%(average 23.42%) for lithofacies III of the Khlong Min formation, 0.49 to 0.53% for Lam Thap formation, 1.11% for the Phun Phin formation, and 6.34% for volcanic rock.

2. Trace elements

The trace element analysis of the Trang group determined by Atomic Absorption Spectrometer for As and Rb. The details description of individual elements in this area as follows;

As values at upper part siltstone and mudstone of the Lam Thap formation is 2 ppm.

Rb values is <1 ppm for Permian limestone, <1 to 2 ppm for Sai Bon formation, and 3 to 28 ppm (average 15.5 ppm) for the Khlong Min formation.

Table A.1 Major element (wt%) of the Trang group

| Rock units | No. of sample | $SiO_2$ | | $Al_2O_3$ | | $Fe_2O_3$ | | $P_2O_5$ | | MgO | | CaO | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Range | Average | Range | Average | Range | Average | Range | Average | Range | Average | Range | Average | |
| Phun Phin Fm. | 1 | 84.11 | 84.11 | 7.21 | 7.21 | 2.79 | 2.79 | | | 0.22 | 0.22 | 1.11 | 1.11 | RPP |
| Sam Chom fm. | No analysis | | | | | | | | | | | | | No Analysis |
| Lam Thap fm. | 2 | 64.65-75.2 | 69.93 | 16.91-17.26 | 17.09 | 1.49-4.66 | 3.08 | | | 0.1-0.41 | 0.26 | 0.49-0.53 | 0.51 | LSC-8,KN1-8 |
| Khlong Min fm. (lithofacies I) | 2 | 3.25-5.52 | 4.39 | 2.98-4.41 | 3.69 | 0.81-1.91 | 1.36 | 0.076-0.111 | 0.094 | 0.8-0.81 | 0.805 | 48.35-49.99 | 49.17 | PT-1,A1-25 |
| Khlong Min fm. (lithofacies III) | 2 | 46.58-54.04 | 50.31 | 1.33-3.43 | 2.38 | 1.53-1.68 | 1.61 | | | 0.88-2.14 | 1.51 | 22.28-24.55 | 23.42 | LLT-4,LP-1 |
| Sai Bon fm. | 2 | 2.41-3.01 | 2.71 | 1.07-1.42 | 1.24 | 0.14-0.36 | 0.25 | 0.009-0.015 | 0.012 | 0.4-0.82 | 0.61 | 52.19-53.04 | 52.62 | MP3,SB1-1 |
| Permian | 1 | 0.54 | 0.54 | 0.15 | 0.15 | 0.08 | 0.08 | 0.004 | 0.004 | 0.49 | 0.49 | 54.87 | 54.87 | PM-4 |
| Volcanic / Siliceous rocks ? | 1 | 75.94 | 75.94 | 4.63 | 4.63 | 1.7 | 1.7 | | | 1.18 | 1.18 | 6.34 | 6.34 | NK-1(Ban Nua Khlong map sheet,4825 III) |

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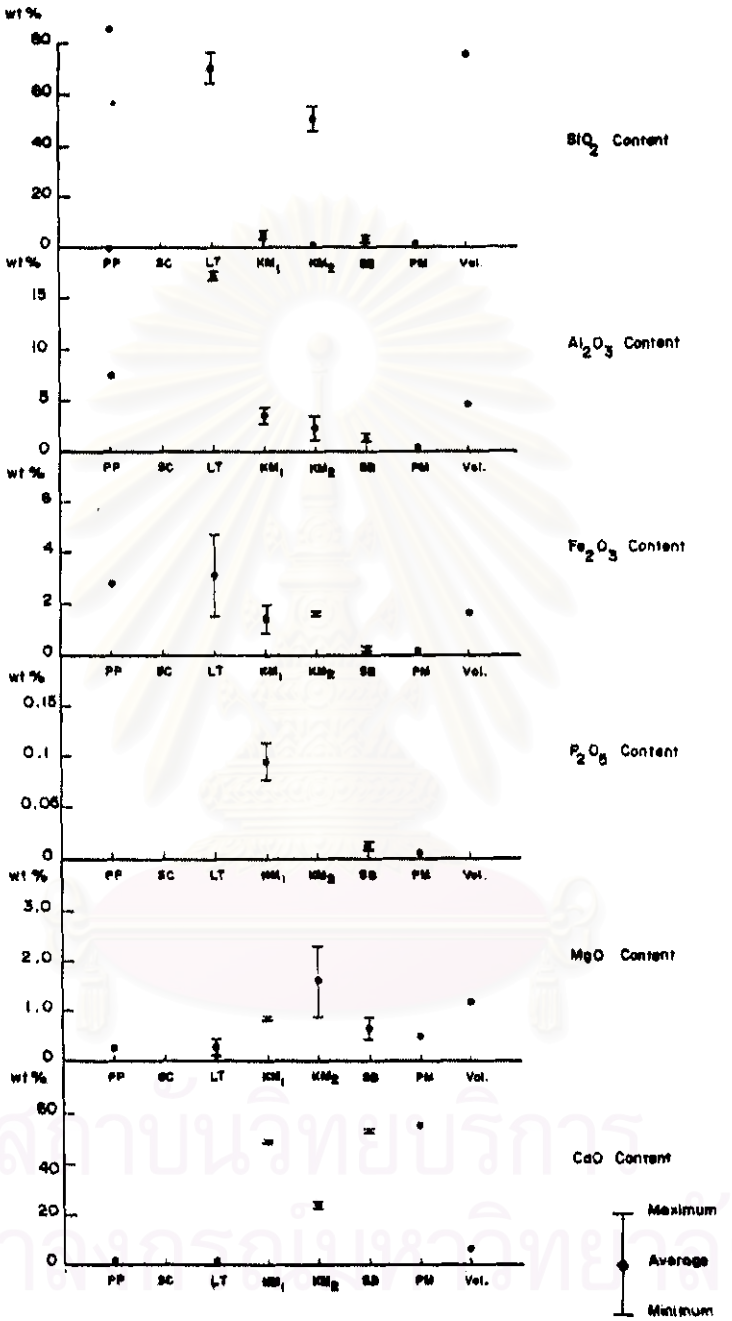


Figure A.1 The major elements of the Trang group; PP=Phun Phin fm., SC= Sam Chom fm., LT=Lam Thap fm., KM1 and KM2=Khlong Min fm., Sb=Sai Bon fm., PM=Permian and Vol.=Volcanic rocks

# APPENDIX A.2

## XRD ANALYSIS

From 3 samples A1-27 and NKM-7 of Khlong Min formation, and LSC-8 determined by X-ray diffractometry (Figure A.2) of Lam Thap formation at Mineral Resource Analysis Division, Department of Mineral Resources, and detailed of determinations are given below.

The sample no. A1-27 is mudstone, gray to light gray with abundant fossils (Measured section A of Khlong Min formation). From XRD determined, the mudstone consists of quartz, kaolinite, illite, and gypsum (Figure A.2).

The sample no. NKM-7 of calcareous mudstone of lithofacies I, Khlong Min formation (Measured section A.). It consists of quartz, kaolinite, calcite, dolomite, and illite (Figure A.2).

From the sample no. LSC-8 of uppermost part of Lam Thap formation (Measured section B). By XRD determined, it consists of quartz, kaolinite, and illite (Figure A.2).

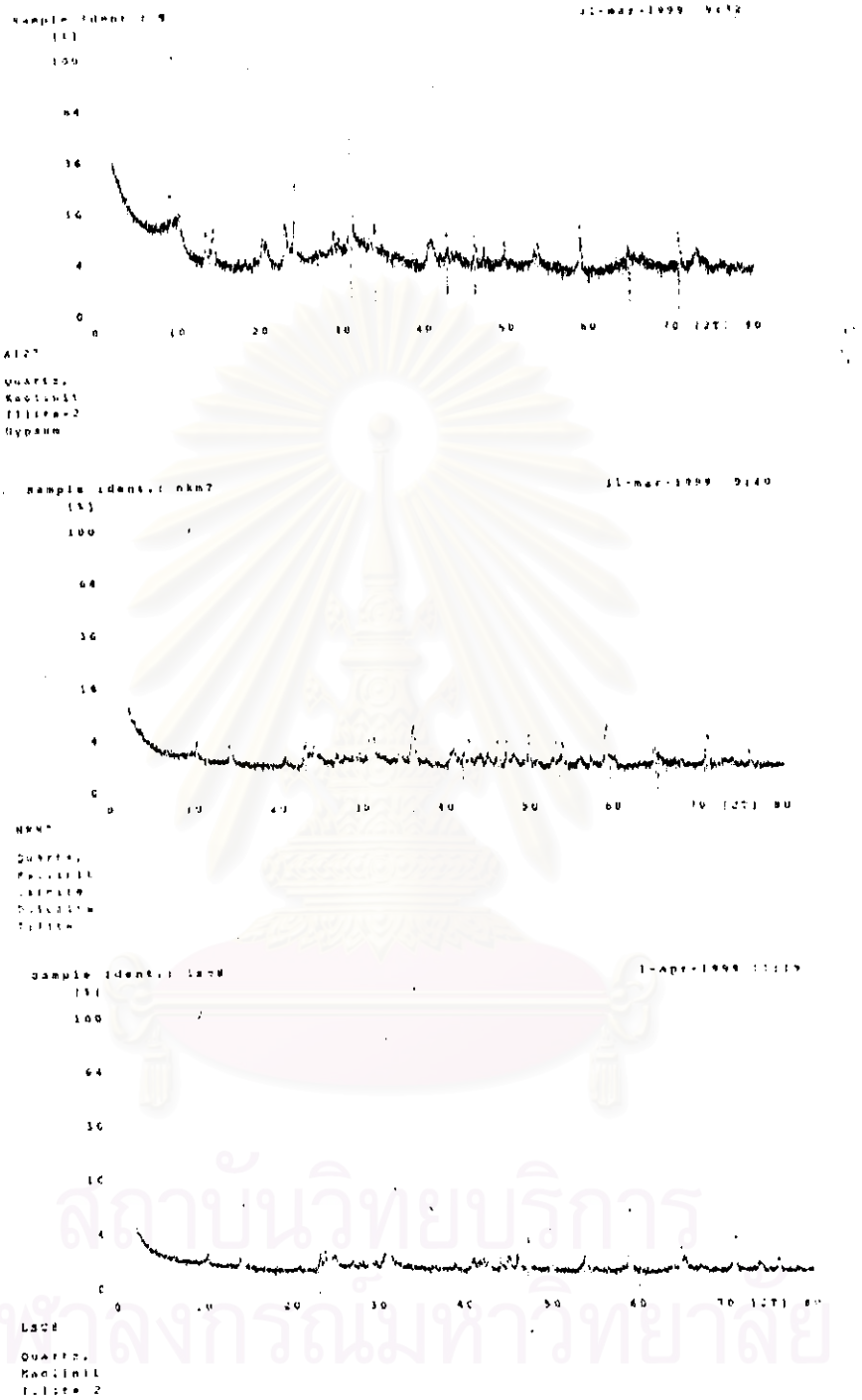

Figure A.2 X-ray diffractogram of samples A1-27, NKM-7 and LSC-8

# VITA

Mr. Naramase Teerarungsigul was born in Nakhon Sa Wan on April 17, 1961. In 1984, he graduated with a B.Sc. degree in Geology from Khon Kaen University. After graduation, he has been working with the Geological Survey Division, Department of Mineral Resources. Later on, he has decided to continue his post-graduate study leading to the M.Sc. degree in Geology at Chulalongkorn University.