

## REFERENCES

- Barberi, F., Ferrara, G., Santacroce, R., Treuil, M., and Varet, J., 1975, A transitional basalt - pantellerite sequence of fractional crystallization, the Boina Centre, (Afar Rift, Ethiopia) : *J. Petrol.*, v.16, p.22-56.
- Barr, S.M., and Dostal, J., 1986, Petrochemistry and origin of megacrysts in Upper Cenozoic basalts, Thailand : *J. SE Asian Earth Sci.*, v.1, p.107-116.
- Barr, S.M., and James, D.E., 1990, Trace element characteristics of Upper Cenozoic basaltic rocks of Thailand, Kamphuchea, and Vietnam : *J. SE Asian Earth Sci.*, v.4, p. 233-242.
- Barr, S.M., and MacDonald, A.S., 1978, Geochemistry and petrogenesis of Late Cenozoic alkaline basalt in Thailand : *Geol. Soc. Malaysia Bull.*, v.10, p.25-52.
- Barr, S.M., and MacDonald, A.S., 1979, Paleomagnetism, age and geochemistry of the Denchai basalts, Northern Thailand : *Earth Planet. Sci. Lett.*, v.46, p.113-124.
- Barr, S.M., and MacDonald, A.S., 1981, Geochemistry and geochronology of Late Cenozoic basalts of Southeast Asia - part I and part II : *Geol. Soc. Am. Bull.*, v.92, p.508-512 and 1069-1142.
- Barr, S.M., and MacDonald, A.S., 1991, Toward a late Palaeozoic - early Mesozoic tectonic model for Thailand : *J. Thai Geos.*, v.1, p.11-22.
- Barr, S.M., MacDonald, A.S., Haile, N.S., and Reynolds, P.H., 1976, Paleomagnetism and age of the Lampang basalt (northern Thailand) and age of the underlying pebble tools : *J. Geol. Soc. Thailand*, v.2, p.1-10.
- Basaltic Volcanism Study Project, 1981, Basaltic volcanism on the terrestrial planets : New York, Pergamon Press Inc., 1286 p.
- Bender, J.F., Hodges, F.N., and Bence, A.E., 1978, Petrogenesis of basalts from the project FAMOUS area - Experimental study from 0 to 15 kbars : *Earth Planet. Sci. Lett.*, v.41, p.277-302.
- Bruan, E.V., and Hahn, L., Compilers, 1976, Geological map of Northern Thailand, sheet 2 (Chiang Rai) scale 1: 250,000 : Federal Institute for Geoscience and Natural Resources, Germany.
- Bunopas, S., and Vella, P., 1983, Tectonic and geologic evolution of Thailand : *In Proceedings, Workshop on Stratigraphic Correlation of Thailand and Malaysia, volume 1* : Haad Yai, Thailand, p.213-232.
- Cann, J.R., 1970, Rb, Sr, Y, Zr, and Nb in some ocean floor basaltic rocks : *Earth Planet. Sci. Lett.*, v.10, p.7-11.
- Carter, J.L., 1970, Mineralogy and chemistry of the earth's upper mantle based on the partial fusion-partial crystallisation model : *Bull. Geol. Soc. Am.*, v.81, p. 2021-2034.
- Chankaeo, K., Saisard, K., Kaenmeephol, B., and Limpachayopas, S., 1996, Geology of the Ban Lo Pa Tum area, Tambon Doi Lan, Amphoe Muang, Changwat Chiang Rai (B.S. thesis) : Chiang Mai, Chiang Mai University, 101 p.

- Chart-prasert, S., Wattanarom, V., Deekudrua, B., and Sadhiarpa, W., 1996, Geology of the Ban Kiang area, Tambon Mae Loi Rai, Amphoe Thoeng, Changwat Chiang Rai (B.S. thesis) : Chiang Mai, Chiang Mai University, 65 p.
- Charusiri, P., Plathong, C., and Pongsapich, W., 1995, Geology and petrochemistry of basaltic rocks at Khao Kradong, Burirum, NE Thailand - Implications for rock wool and tectonic setting : *In Proceedings, the Eighth Regional Conference on Geology, Minerals and Energy Resources of Southeast Asia* : Manila, Philippine, Abstracts, p.1.
- Duncan, R.A., 1987, The Karoo igneous province - A problem area for inferring tectonic setting from basalt geochemistry : *J. Vol. Geotherm. Res.*, v.32, p. 13-34.
- Flower, M., and Hoang, N., 1996, Petrogenesis of Cenozoic basalts from Vietnam - Implications for origins of a 'Diffuse Igneous Province': *International Symposium on Lithosphere Dynamic of East Asia* : Geol. Soc. China, Taipei, Taiwan, Abstracts, p.38.
- Floyd, P.A., and Winchester, J.A., 1975, Magma type and tectonic setting discrimination using immobile elements : *Earth Planet. Sci. Lett.*, v.27, p. 211-218.
- Frey, F.A., Green, D.H., and Roy, S.D., 1978, Integrated models of basalt petrogenesis - A study of quartz tholeiites to olivine melilitites from SE Australia utilizing geochemical and experimental petrological data : *J. Petrol.*, v.19, p.463-513.
- Fujii, T., and Bougault, H., 1983, Melting relations of a magnesian abyssal tholeiite and origin of MORBs : *Earth Planet. Sci. Lett.*, v.62, p.283-295.
- Green, D.H., and Ringwood, A.E., 1967, The genesis of basaltic magmas : *Contr. Mineral. Petrol.*, v.15, p.103-190.
- Green, D.H., and Ringwood, A.E., 1970, Mineralogy of peridotitic composition under upper mantle conditions : *Phys. Earth Planet. Inter.*, v.3, p.359-371.
- Green, D.H., Hibberson, W.O., and Jaques, A.L., 1979, Petrogenesis of mid-ocean basalts. *In* McElhinny, W.H., ed., *The Earth : Its Origin, Structure and Evolution*, London, Academic Press, p.265-299.
- Grove, T.L., and Bryan, W.B., 1983, Fractionation of pyroxene-phyric MORB at low pressure - An experimental study : *Contr. Mineral. Petrol.*, v.84, p.293-309.
- Grove, T.L., Walker, D., Longhi, J., Stolper, E., and Hays, J. F., 1973, Petrology of rocks 12002 and origin of picritic basalts at Oceanus Procellarum : *Geochim. Cosmochim. Acta.*, Suppl.4, v.1, p.955-1011.
- Hess, P.C., 1989, *Origin of igneous rocks*, London, Harvard University Press., 336 p.
- Hoke, L., and Campbell, H.J., 1995, Active Mantle melting beneath Thailand? : *In Proceedings, International Conference on Geology, Geotechnology and Mineral Resources of Indochina (Geo-Indo'95)* : Khon Kaen, Thailand, p.13-22.
- Holm, P.E., 1982, Non-recognition of continental tholeiites using the Ti-Zr-Y diagram : *Contr. Mineral. Petrol.*, v.79, p.308-310.
- Hughes, C.J., 1982, *Igneous petrology*, New York, Elsevier, 551 p.

- Intasopa, S., 1993, Petrology and geochronology of the volcanic rocks of the central Thailand volcanic belt (Ph.D. thesis) : New Brunswick, University of New Brunswick, 242 p.
- Irving, A.J., and Green, D.H., 1976, Geochemistry and petrogenesis of the Newer basalts of Victoria and South Australia : *J. Geol. Soc. Australia.*, v.23, p.45-66.
- Ito, K., and Kennedy, G.C., 1967, Melting and phase relations in a natural peridotite to 40 kilobars : *Am. J. Sci.*, v.265, p.519-538.
- Jaques, A.L., and Green, D.H., 1980, Anhydrous of peridotite at 0-15 Kb pressure and the genesis of tholeiitic basalts : *Contr. Mineral. Petrol.*, v.73, p.287-310.
- Jungyusuk, N., and Khositantont, S., 1992, Volcanic rocks and associated mineralization in Thailand : *In Proceedings, National Conference on Geologic Resources of Thailand* : Bangkok, Thailand, p.528-532.
- Kushiro, I., 1973, Origin of some magmas in oceanic and circum-oceanic regions : *Tectonophysics*, v.17, p.211-222
- Lee-am, K., Chanprasert, C., Suwankanthi, N., and Srichan, W., 1996, Geology of the Ban Chiang Khian area, Tambon Chiang Khian, Amphoe Thoeng, Changwat Chiang Rai (B.S. thesis) : Chiang Mai, Chiang Mai University, 81 p.
- Le Bas, M.J., Le Maitre, R.W., Streckeisen, A., and Zanethien, B., 1986, A chemical classification of volcanic rocks based on the total alkali-silica diagram : *J. Petrol.*, v.27, p.745-750.
- Mahattanachai, T., Kanthasap, P., and Thurarat, R., 1996, Geology of the Ban Khon Sung area, Tambon Ngue, Amphoe Thoeng, Changwat Chiang Rai (B.S. thesis) : Chiang Mai, Chiang Mai University, 68 p.
- Meschede, M., 1986, A method of discriminating between different types of mid-ocean ridge basalts and continental tholeiites with the Nb-Zr-Y diagram : *Chem. Geol.*, v. 56, p.207-218.
- Miyashiro, A., 1975, Classification, characteristics, and origin of ophiolites : *J. Geol.*, v. 83, p. 249-281.
- Miyashiro, A., 1978, Nature of alkalic volcanic rock series : *Contr. Mineral. Petrol.*, v. 66, p. 91-104.
- Myers, R., and Bretkopf, J.H., 1989, Basalt geochemistry and tectonic settings - A new approach to relate tectonic and magmatic processes : *Lithos*, v.23, p.53-62.
- Nicholls, 1967, Geochemical studies in the ocean as evidence for the composition of the mantle, *In Runcorn, S.K., ed., Mantles of the Earth and Terrestrial Planets*, Interscience, p.285-304.
- Nicholls, J., 1988, The statistics of Pearce element diagrams and the Chayes closure problem : *Contr. Mineral. Petrol.*, v.99, p.11-24.
- Panjasawatwong, Y., 1995, Late Cainozoic basalts from Khao Phanom Sawai, Northeastern Thailand - Petrography and geochemistry : *In Proceedings, the Eighth Regional Conference on Geology, Minerals, and Energy Resources of Southeast Asia* : Manila, Philippine, Abstracts, p.2.

- Panjasawatwong, Y., and Yaowanoyothin, W., 1993, Petrochemical study of post-Triassic basalts from the Nan suture, Northern Thailand : *J. SE Asian Earth Sci.*, v.8, p.147-158.
- Panjasawatwong, Y., and Youngsnong, M., 1996, Chiang Khong corundum-bearing basalt, Amphoe Chiang Khong, Changwat Chiang Rai : *J. Sci. Fac., Chiang Mai University*, v. 23(1), p. 39-52.
- Pearce, T.H., 1968, A contribution to the theory of variation diagrams : *Contr. Mineral. Petrol.*, v.19, p. 142-157.
- Pearce, J.A., and Norry, M.J., 1979, Petrogenetic implications of Ti, Zr, Y and Nb variations in volcanic rocks : *Contr. Mineral. Petrol.*, v.69, p.33-47.
- Pearce, J.A., 1980, Geochemical evidence for the genesis and eruptive setting of lavas from Tethyan ophiolites: *In Proceedings, International Ophiolite Symposium : Cyprus*, p.261-272
- Pearce, J.A., 1982, Trace element characteristics of lavas from destructive plate boundaries, *In Thorpe, R.S., ed., Andesites - Orogenic Andesites and Related Rocks*, Norwich, Page Bros. Ltd., p. 525-548.
- Pearce, J.A., 1983, Role of subcontinental lithosphere in magma genesis at destructive plate margins, *In Hawkesworth, C.J., and Norry, M.J. eds., Continental Basalts and Mantle Xenolith*, Nantwich, Shiva Publishing, p.230-249.
- Pearce, J.A., and Cann, J.R., 1973, Tectonic setting of basic volcanic rocks determined using trace element analyses : *Earth Planet. Sci. Lett.*, v.19, p.290-300.
- Pongsaeree, W., Kornawan, A., Chongsureeyapas, C., and Nanthachan, R., 1996, Geology of the Ban Cham Hai area, Tambon Plong, Amphoe Thoeng, Changwat Chiang Rai (B.S. thesis) : Chiang Mai, Chiang Mai University, 91 p.
- Prestvik, T., 1982, Basic volcanic rocks and tectonic setting - A discussion of the Zr-Ti-Y discrimination diagram and its suitability for classification purposes : *Lithos*, v.15, p. 241-247.
- Ringwood, A.E., 1966, The Chemical composition and origin of the Earth, *In Hurley, P.M., ed., Advances in Earth Science*, M.I.T. Press, p.287-356.
- Road Association of Thailand, 1993, Thailand highway map scale 1 : 1,000,000 : Bangkok, Department of Highway HQ, p.10.
- Roeder, P.L., and Emslie, R.F., 1970, Olivine - liquid equilibrium : *Contr. Mineral. Petrol.*, v.29, p.275-289.
- Royal Thai Survey Department, 1989, Topographic map series L 7017S, sheet 4948 II (Amphoe Pa Daed), scale 1 : 50,000.
- Royal Thai Survey Department, 1989, Topographic map series L 7017S, sheet 5048 III (Amphoe Thoeng), scale 1 : 50,000.
- Royal Thai Survey Department, 1989, Topographic map series L 7017S, sheet 5048 IV (Amphoe Phaya Meng Rai), scale 1 : 50,000.
- Russell, J.K., and Nicholls, J., 1988, Analysis of petrologic hypotheses with Pearce element ratios : *Contr. Mineral. Petrol.*, v.99, p.25-35.
- Sasada, M., Ratanasathien, B., and Soponpongpiat, P., 1987, New K-Ar ages from the Lampang basalts, Northern Thailand : *Bull. Geol. Survey Japan*, v.38, p. 13-20.

- Schilling, J.G., Zajac, M., Evans, R., Johnston, T., White, W., Devine, J.D., and Kingsley, R., 1983, Petrologic and geochemical variations along the mid-Atlantic ridge from 27°N to 73°N : *Am. J. Sci.*, v.283, p. 510-586.
- Shervais, J.W., 1982, Ti-V plots and the petrogenesis of modern and ophiolitic lavas : *Earth Planet. Sci. Lett.*, v. 59, p.101-118.
- Sirinawin, T., 1981, Geochemistry and genetic significance of gem-bearing basalts in Chanthaburi - Trat area (M.S. Thesis) : Chiang Mai, Chiang Mai University, 87 p.
- Smith, A.D., 1996, Intraplate volcanism in Asia and the origin of the DUPAL anomaly : *In International Symposium on Lithosphere Dynamic of East Asia* : Geol. Soc. China, Taipei, Taiwan, Abstracts, p.40-43.
- Stanley, C.R., and Russell, J.K., 1989, Petrologic hypothesis testing with Pearce element ratio diagrams - Derivation of diagram axes : *Contr. Mineral. Petrol.*, v.103, p.78-89.
- Sukvattanant, P., Tansathian, W., Prasitthikarnkul, K., Mukdee, P., and Prikyai, P., 1985, Geology of the Ban Mae Pao Luang and Amphoe Thoeng, Changwat Chiang Rai : Bangkok, Department of Mineral Resources, 36 p.
- Sun, S.S. and MacDonough, W.F., 1989, Chemical and isotope systematic of oceanic basalts - Implications for mantle composition and processes, *In Saunders, A.D., and Norry, M.J., eds., Magmatism in Ocean Basins*, Geological Society Special Publication 42, p.313-345.
- Sutthirat, C., Charusiri, P., Farrar, E., and Clark, A.H., 1994, New  $^{40}\text{Ar}/^{39}\text{Ar}$  geochronology and characteristics of some Cenozoic basalts in Thailand : *In Proceedings, International Symposium on Stratigraphic Correlation of Southeast Asia* : Bangkok, Thailand, p.306-320.
- Sutthirat, C., 1995, Petrochemistry of basalts in Amphoe Sop Prab and Amphoe Ko Kha, Changwat Lampang (M.Sc. thesis) : Bangkok, Chulalongkorn University, 158 p.
- Sutthirat, C., Charusiri, P., Pongsapich, W., Farrar, E., and Landgridge, R., 1995a, A Late Pliocene Ko Kha - Sop Prap and Nam Cho basaltic eruption, Northern Thailand - Evidences from geology and  $^{40}\text{Ar}/^{39}\text{Ar}$  geochronology : *In Proceedings, International Conference on Geology, Geotechnology and Mineral Resources of Indochina* : Khon Kaen, Thailand, p.247-253.
- Sutthirat, C., Pongsapich, W., Charusiri, P., and Hansawek, R., 1995b, Petrochemistry of the Phu Fai Gabbroid suites and their associated gemstones, Sri Saket, NE. Thailand : *In Proceedings, the Eighth Regional Conference on Geology, Minerals and Energy Resources of Southeast Asia* : Manila, Philippine, Abstracts, p.21.
- Takashashi, E., and Kushiro, I., 1983, Melting of a dry peridotite at high pressures and basalts magma genesis : *Am. Min.*, v. 68, p.859-879.
- Taylor, S.R., and Gorton, M.K., 1977, Geochemical application of spark-source mass spectrometry. III - Element sensitivity, precision and accuracy : *Geochim. Cosmochim. Acta*, v.41, p.1375-1380.
- Thiankam, K., Tila, N., Komutamutra, S., and Muangsuwan, A., 1996, Geology of the Ban Mai Pattana area, Amphoe Pa Daed, Changwat Chiang Rai (B.S. thesis) : Chiang Mai, Chiang Mai University, 84 p.

- Thompson, R.N., 1972, Melting behaviour of two Snake River lavas at pressures up to 35 kb : Geophys. Lab. Yearbook 71, Carnegie Inst. Wash., p.406-410.
- Thornton, C.P., and Tuttle, O.F., 1960, Chemistry of igneous rocks 1 - Differentiation index : Am. J. Sci., v.258, p.664-684.
- Tupia, S., and Nicholls, J., 1996, Petrology of recent lava flows, volcano mountain, Yukon Territory, Canada : Lithos, v.37, p.61-78.
- Vichit, P., 1992, Gemstones in Thailand : *In* Proceedings, National Conference on Geologic Resources of Thailand, supplementary volume : Bangkok, Thailand p.124-150.
- Vichit, P., Vudhichativanich, S., and Hansawek, R., 1978, The distribution and some characteristics of corundum-bearing basalts in Thailand : J. Geol. Soc. Thailand, v.3, p.M4-M38.
- Wilson, M., 1989, Igneous Petrogenesis, London, Unwin Hyman, 466 p.
- Winchester, J.A., and Floyd, P.A., 1977, Geochemical discrimination of different magma series and their differentiation products using immobile elements : Chem. Geol., v.20, p.325-343.
- Yaemniyom, N., 1982, The petrochemical study of corundum-bearing basalts at Bo Ploi District, Kanchanaburi (M.Sc. thesis) : Bangkok, Chulalongkorn University, 100 p.
- Yamamoto, M., 1991, Occurrences and petrochemistry of the Lampang and Sop Prap basalt, Northern Thailand : Report of Research Institute of Natural Resources, Mining college, Akita University, Japan, no. 56, p.85-94.
- Yoder, H.S., and Tilley, C.E., 1962, Origin of basalt magmas - An experimental study of natural and synthetic rock systems : J. Petrol., v.3, p.342-532.