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Petrography and Geochemistry of Igneous Rocks from the Bokeo and Luong Namtha Provinece, Lao PDR

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Intrusive igneous rocks located in Bokeo and Luong Namtha provinces, northwest of Lao PDR is believed to be a part of the Sukhothai volcanic arc which is also named Eastern Granitoid Belt in Thailand. The intrusive igneous rocks in the study area are divided into basic to intermediate and acidic compositions.

The basic to intermediate rocks are gabbro, gabbroic diorite and diorite with the general mineral assemblage plagioclase + clinopyroxene + hornblende ± quartz ± biotite + opaque mineral ± apatite. The rocks are characterized by a seriate fabric with the presence of sieve-textured amphibole and zoned plagioclase. Minor amounts of clinopyroxene are also found as small subhedral grains with amphibole rims. Bivariate major and minor chemical element plots indicate a calc-alkaline fractionation trend. In chondrite normalized rare earth element plots no distinct negative Eu anomaly is observable indicating that plagioclase fractionation did not occur. The primitive mantle normalized multielement plot shows a Nb and Ta trough, typical for subduction related rocks. In the Zr–Ti plot after Pearce (1982) the basic to intermediate samples plot into the Island Arc Lavas field.

The acidic intrusive rocks can be classified as granodiorite and granite. They contain the mineral assemblage quartz + plagioclase + K-feldspar + biotite ± opaque mineral ± apatite ± zircon/monazite ± allanite ± cordierite. Samples display a seriate texture with zoned plagioclase and perthitic potassium feldspar grains. Major and minor element chemistry are typical for calc-alkaline granitoids with I-type affinity. While the granitic samples display a well developed negative Eu anomaly, the granodiorite samples did not develop one and have in general lower contents of rare earth elements. The primitive mantle normalized multielement plot shows a similar pattern as the basic to intermediate rocks. The granite tectonic discrimination plots after Pearce et al. (1984) classifies the granitic and granodioritic samples as volcanic arc granites (VAG).

The first geochemical results of this study indicate that the intrusive igneous rocks form Bokeo and Luong Namtha provinces belong to a volcanic arc setting related to the closure of the Paleo-Tethys during early Permian to middle Triassic times.

Julian A Pearce (1982). Trace element characteristics of lavas from destructive plate boundaries. Andesites, 8, 525-548.
Julian A Pearce, Nigel BW Harris, Andrew G Tindle (1984). Trace element discrimination diagrams for the tectonic interpretation of granitic rocks. Journal of Petrology,25, 956-983.