The zircon Hf-isotope constraints on the distribution of mineral deposits in the Sukhothai Fold Belt, Thailand

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The Sukhothai Fold Belt (SFB) hosts several vein-type gold-antimony-base metal deposits and tungsten-antimony breccia-type deposits. Copper-antimony-lead sulfide minerals occurred at the contact zone of the youngest granite phase of the Tak Batholith [7], [8] which raises possibility of gold and sulfide minerals being genetically related to the intrusion of Late Triassic granitoids [1].

In this study, we use U-Pb dating and Hf isotope analysis of zircon in the granitoids in the SFB to discuss the relationship between magma sources and the associated mineralization. The granitoids in the SFB consist of granodiorites and granites, which occur mainly in the east and west of the belt, respectively. The results of U-Pb dating show that in the northern part of the SFB, the granitoids yielded an age of 243-227 Ma, while an age of 204 Ma was obtained from the granitoid in the southeastern part of the SFB. The Hf-isotope composition of granitoids in the SFB is characterized by both positive- ε Hf initial values (0.0 to +9.2) and negative- ε Hf initial values (-6.1 to 0.0), which indicate mixed source of magma, which include juvenile mantle and reworked crustal components.

A zircon Hf-isotope compilation including the data obtained in this study and previously reported ones [2], [3], [4], [5], [6], [9], [10] were used to prepare a map, that allows a comparison between magmatic source and mineral deposit distribution in Thailand. The magmatic source for the granitoids in the Loei Fold Belt is dominated by juvenile mantle-derived components, as shown by positive- ε Hf initial values (+4.1 to +11.0) [2], and contributed to porphyry system. In contrast, the Sibumasu Block and Inthanon Zone originated from reworked old crustal materials, as indicated by negative- ε Hf initial values (-27.1 to -5.4) [2], [3], [4], [5] [6], [9], and produced S-type granite-related tin-tungsten mineralization. On the other hand, the various ε Hf initial values (-8.1 to +9.2) [this study], [2], [3], [9], [10] from the intrusions in the SFB suggest mixed sources including evolved and juvenile magma materials, which generated the gold, antimony, and base metal vein deposits and tungsten-antimony breccia-type deposits.

Reference

[1] Crow and Khin Zaw. in Ridd. The Geol. Soc. 2011.
[2] Dew et al. Lithos. 2018.
[3] Dew et al. Data Brief. 2018.
[4] Gardiner et al. Gondwana Res. 2016.
[5] Gardiner et al. Sci. Rep. 2017.
[6] Gardiner et al. Gondwana Res. 2018.
[7] Mahawat et al. J. Southeast Asian Earth Sci. 1990.
[8] Pongsapich and Mahawat. Geol. Soc. Malaysia Bull. 1977.
[9] Wang et al. Gondwana Res. 2016.
[10] Wang et al. Lithos. 2016.

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