Types, mechanisms and tectonic-magmatic controls of rare metal mineralizations in China: An overview

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There occur five major types of rare metal mineralization in China, namely granite-type, pegmatite-type, volcanic rock-type, carbonatite complex-type, and hydrothermal vein-type. The granite-type rare metal deposits are widespread but the most important ones occur in eastern China. There are two major sub-types, one is alkali-feldspar granite type (such as the giant 414 Ta–Nb–Li deposit in Jiangxi Province of southeastern China), the other is alkaline granite type (such as the highly evolved Baerzhe alkaline granite type Zr–REE–Nb mineralization in northeastern China). The mechanism for rare metal granites still remains controversy. Although a magmatic origin is favoured but in many cases post-magmatic processes such as late-stage hydrothermal metasomatism played a vital role for the extreme rare metal enrichments.

Except for the well-known rare metal pegmatites in the Altai region of northwestern China (such as the Koktokay No 3 pegmatites), recent exploration indicates Sichuan Province of southwestern China occurs great amounts of this type mineralization (such as the Jiajika pegmatites, the largest spodumene deposit in Asia). The ore-forming mechanisms include fractional crystallization, immiscible liquid segregation, and magmatic-hydrothermal transition.

There are several recent discoveries of volcanic rock type rare metal deposits in China, such as the Yongding Ta-Nb deposit of Fujian Province which hosted in subvolanic intrusion facies and the Baiyanghe volcanic Be-U-Mo deposit in Xinjiang (the largest Be deposit in Asia). The origin for these deposits has been proposed as either volcanic magmatic processes or late-stage hydrothermal overprinting.

Except for the magmatic and hydrothermal processes that control the formation of individual rare metal granite and pegmatite, we also found an important tectonic control on the rare metal metallogenic province by core complex formation and syn-extensional magmatism, which shed new light for regional exploration of rare metal deposits.