WANG Chunlong, QING Kezhang, ZHOU Qifeng and TANG Dongmei, 2014. Contribution of Multiple Magmatism to the Formation of Li-Be-Nb-Ta Pegmatites: Evidence from Zircon U-Pb Ages in the Kelumute-Jideke Pegmatite Field, Northwestern China. *Acta Geologica Sinica* (English Edition), 88(supp. 2): 468-469.

Contribution of Multiple Magmatism to the Formation of Li-Be-Nb-Ta Pegmatites: Evidence from Zircon U-Pb Ages in the Kelumute-Jideke Pegmatite Field, Northwestern China

WANG Chunlong[1, 2, 3], QING Kezhang[1, 2], ZHOU Qifeng[1] and TANG Dongmei[1]

1 *Key Laboratory of Mineral Resources, Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing 100029, China*
2 *Xinjiang Research Center for Mineral Resource，Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences, Urumqi, 830011, China*
3 *University of Chinese Academy of Sciences, Beijing 100049, China*

1 Regional and Ore Geology

Located in the central part of Altay pegmatite province, Northwestern China, the Kelumute-Jideke pegmatite field (KJPF) provides a natural lab to study the regional zonation of pegmatite and longevity of pegmatitic magmatism. Rare-metal pegmatites in the KJPF are interpreted to be genetically related to the emplacement of the Jideke two-mica granite, which is described as the parental pluton by previous studies (eg. Lv et al., 2012). Except for the Kelumute Li-Be-Nb-Ta pegmatite located inside the Jideke two-mica granite, other pegmatites with different types of mineralization distributed outward the parental pluton are as following: Azubai, Xiaojideke and Dajideke muscovite-Be, Qunkuer Be-Nb-Ta, Jiamukai Li-Nb-Ta and Kukalagai Li-Be-Nb-Ta pegmatite, corresponding to the regional zonation of pegmatite groups (Černý, 1991).

Kelumute and Kukalagai are the only two large-scale rare metal deposits in the KJPF. The Kelumute No.112 pegmatite is 1200 m in length, varying in thickness from 3.81 m (east) to 7.31 m (west), and is 200 m deep; its rare metal reserve is the second largest after the most famous Koktokay No. 3 pegmatite in the Altay pegmatite province. The main part of No. 112 pegmatite occurs EW-trending, which is controlled by faults of same direction. Five internal zones have been identified by mineral assemblages and textures, including quartz- microcline-albite zone, blocky quartz-albite-microcline zone, quartz-albite-spodumene zone, albite-quartz- muscovite zone and saccharoidal albite zone. The Kukalagai No. 650 pegmatite dips westward with an angle of 60° to 78°, which is controlled by N-S trending foliation of biotite-quartz schist. With a length of 1230 m and an average thickness of 9.88 m, the only internal zone in No. 650 pegmatite is quartz-spodumene-albite zone, with lepidolite aggregates and medium-coarse garnet grains developed locally. It iss worth mentioning that evidence of replacement (eg. saccharoidal albite and blocky quartz–muscovite) and reconstruction on the earlier pegmatite (nests of spodumene and massive albite in quartz-spodumene-albite pegmatite) were identified during field observation in both No. 112 and No. 650 pegmatite.

2 Zircon U-Pb Dating

To reveal the timing of pegmatitic magmatism, a study of LA-ICP-MS zircon U-Pb dating is conducted on the Kelumute and Kukalagai pegmatites. Zircons in this study are opaque and anhedral, indicating that these magmatic zircons have experienced different degrees of hydrothermal alteration. However, due to the high closure temperature, homogeneous, clear and less porous zircons or domains of these zircon grains still yield concordant ages with geological significance. Three weighted mean $^{206}Pb/^{238}U$ ages are observed in one sample from quartz-albite-spodumene zone of the Kelumute No. 112 pegmatite, which are 237 ± 5 Ma (n=1), 196.9 ± 4.5 Ma (n=8) and 156.6 ± 3.9 Ma (n=8). Similarly, one sample from quartz-spodumene-albite zone of the Kukalagai No. 650 pegmatite shows two weighted mean $^{206}Pb/^{238}U$ ages: 233.8 ± 2.5 Ma (n=9) and 204.4 ± 4.1 Ma (n=7).

* Corresponding author. E-mail: chunlong-wang@hotmail.com

3 Discussion and Conclusion

Combined with zircon U-Pb ages of different zones of Kelumute No. 112 pegmatite by Lv et al. (2012), eight different weighted mean $^{206}Pb/^{238}U$ ages were identified between 238 and 156 Ma, which can't be described as a single magmatic-hydrothermal activity that lasted for more than 80 Ma. Statistics of zircon $^{206}Pb/^{238}U$ ages from different pegmatites in the KJPF in this study and previous researches (eg. Ren et al., 2011; Lv et al., 2012; Qin et al., 2013) showing a normal distribution, with peaks at 238~233 Ma, 220~215 Ma, 208~188 Ma and 158~155 Ma, indicating that four generations of pegmatite have been formed. Thus, the pegmatite- generating magmatism occurred in pulses, and Li-Be-Nb-Ta pegmatites were formed by multiple magmatism.

Mesozoic post-orogenic setting in the Chinese Altay is widely accepted (eg. Allen et al., 1995; Yakubchuk, 2004), under which these multiple pegmatitic magmatism could be attributed to the melting of thickened crust during the tectonic transition from collision to extension (Liu, 1990; Han, 2008). We propose that re-activation of pre-existing structures triggered the pegmatitic magmatism pulses, reflecting the longevity and complexity of E-W and NW faulting in the KJPF. However, considering the genetic relationship between the parental pluton and pegmatites, more evidences are needed to verify the multiple emplacement of the parental pluton, for pegmatites of different fractionation degree formed in every magmatic pulse.

Acknowledgement

Doctor Jun-Xing Zhao and Ming-Jian Cao are thanked for their assistance with LA-ICP-MS analyses and constructive reviews.

References

Allen, M.B., Sengör, A.M.C and NatalIn, B.A., 1995. Junggar，Turfan and Alakol basins as Late Permian to? Early Triassic extensional structures in a sinistral shear zone in the Altaid orogenic collage, Central Asia. Journal of the Geological Society, 152(2): 327-338.

Černý P., 1991. Rare-element granitic pegmatites. II. Regional to global environments and petrogenesis. Geoscience Canada，18: 68 - 81

Han Baofu, 2008. A preliminary comparison of Mesozoic granitoids and rare metal deposits in Chinese and Russian Altai Mountains. Acta Petrologica Sinica，24(4): 655 - 660 (in Chinese with English Abstract)

Liu Wei, 1990. Petrogenetic epoches and peculiarities of genetic types of granitoids in the Altai Mts, Xinjiang Uygur AutoNomous Region, China. Geotectonica et Metalogenia, 14 (l): 43-56 (in Chinese with English Abstract)

Lv Z.H., Zhang H., Tang Y and Guan S.J., 2012. Petrogenesis and magmatic-hydrothermal evolution time limitation of Kelumute No. 112 pegmatite in Altay，Northwestern China: Evidence from zircon U-Pb and Hf isotopes. Lithos, 154(0): 374-391.

Qin Kezhang，Guo Zhenglin，Shen Maode，Tang Dongmei，Zhou Qifeng，Wang Chunlong，Guo Xuji，Tian Ye and Ding Jiangang, 2013. Types, intrusive and mineralization ages of pegmatite rare-element deposits in Chinese Altay. Xinjiang Geology，31(Sup): 1-7 (in Chinese with English abstract).

Ren Baoqin，Zhang Hui，Tang Yong and Lv Zhenghang. 2011. LA-ICP MS U-Pb zircon geochronology of the Altay pegmatites and its geological significance. Acta Mineralogica Sinica, 31(3): 587-596 (in Chinese with English Abstract).

Yakubchuk A., 2004. Architecture and mineral deposit settings of the Altaid orogenic collage: a revised model. Journal of Asian Earth Sciences, 23(5): 761-779.