Contrasting trace element signatures in in-situ melt and large volume melt in hornblende-dehydration melting

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In-situ melt and mafic granulite host [1] were describedfrom the Kabbaldurga quarry in south India. A large volume melt and mafic granulite enclaves were described (Ref:2) from the Eastern Ghats,India. Relative to the restitic mafic granulite, both the in-situ and large volume melt show enrichment in incompatible elements: Rb,Ba & Sr, but less pronounced enrichment in Rb & K in the in-situ melt indicates incomplete melt-restite separation. Similarly, pronounced depletion in Ti, Zn, Cu & Ni in the large volume melt, but Ti & Cu enrichment in the in-situ melt, could only be explained as poor melt-restite separation. In hornblende-dehydration melting, behaviour of Sr, Y, Zr & Nb could indicate the role of plagioclase, garnet and accessory phases like zircon. Significant Sr depletion, but no Y depletion in the in-situ melt of granitic composition would indicate lack of plagioclase involvement in melting; lack of Sr & Y depletion in large volume melt of tonalitic composition would indicate that plagioclase was largely consumed in melting reaction. Another marked contrast is in Zr & Nb behaviour: Zr depletion could reflect poor melt-restite interaction but Nb enrichment in the large volume melt could only be due to a more complete interaction with restitic garnet, which is common in this suite. In the in-situ melt,Zr enrichment, but no Nb depletion could indicate poor melt-restite separation, garnet being absent in this suite.

References:

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Mineral chemistry studies on crystallization conditions of mineralized alkaline intrusions in Ailaoshan-Jinshajiang alkaline intrusion belt, Western Yunnan, China

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The NW-NNW trending Ailaoshan-Jinshajiang fault zone is one of the biggest strike-slip systems on Earth related to escape tectonics from the India-Eurasia collision since the early Himalayan orogeny. The large Ailaoshan-Jinshajiang alkaline intrusive belt is developed along or near the Ailaoshan-Jinshajiang fault zone. This magmatic belt formed in Himalayan is over 2000 km long and generally 50-80 km wide. These intrusions were derived from partial melting of an enriched upper mantle source in a rift or crustal extension tectonic setting. In recent years numerous gold and copper deposits and occurrences have been discovered in the area, which are spatially related to and contemporaneous with some alkaline intrusions. The recent researches showed that there are genetic connections between alkaline magma and mineralzation. We examined two alkaline intrusions in the belt, Yao'an syenite porphyry intrusion, which is related to Au mineralization and Machangqing granite porphyry intrusion, which is related to Cu mineralzation.

A study of the dominant silicate minerals from evolved granite phases, provide insights into the crystallization conditions (T, P, fO_2) of the mineralized alkaline intrusions in the Ailaoshan-Jinshajiang alkaline intrusive zone. For Yao'an syenite porphyry intrusion, temperatures derived from amphibole-plagioclase thermometry suggest crystallization at about 820°C. Pressure estimates derived from Al in amphibole barometry range between 3.0 and 3.8 kilobars. These are higher than that for Machangqing granite porphyry intrusion. Oxygen fugacity estimates from biotite of Yao'an syenite porphyry intrusion is also higher than that of Machangqing granite porphyry intrusion. Combine with the similar characteristics on tectonic setting, age of mineralization, source region and slightly different on chemical composition in both intrusions suggest the different mineralization of these two intrusions were probably related to the difference on physical-chemical condition (such as T,P, fO_2 etc.) during magmatic crystallization and different melted degree of the same source.