

Petrogenesis of mafic microgranular enclaves, host monzogranite and diorite from Xiaojiang pluton, SE China

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Mafic microgranular enclaves (MMEs) generally have different isotopic compositions with their host granitoids and they are commonly considered as a product of magma mixing of mantle-derived magma and crustal magma. Nevertheless, sometimes MMEs and their host may have similar isotopic compositions and trace element characteristics, which can lead to controversy on their origin and petrogenesis. On the basis of field observations and geochemical studies, we constrained the petrogenesis and associated magma mixing process of Xiaojiang pluton in SE China.

Xiaojiang pluton mainly consists of biotite granite, monzogranite and diorite. The monzogranite contains abundant MMEs with microgranular and igneous-texture. Zircon U-Pb ages indicate that the MMEs, host monzogranite and diorite are coeval and formed in the Early Cretaceous. They also have identical whole rock Sr-Nd and zircon Hf isotopic compositions and trace element characteristics. Chemical and isotopic equilibration between MMEs and their host granite caused by thorough magma mixing may account for their identical Sr-Nd-Hf isotopic compositions. However, Xiaojiang diorite has very similar Sr-Nd-Hf isotopic compositions with monzogranite and MMEs. Therefore, their identical Sr-Nd-Hf isotopic compositions are likely to inherit from the source region and thus can be ascribed to cognate. In summary, the formation processes of Xiaojiang plutons can be roughly described as follows: the parent magma in the deep magma chamber has experienced obvious magmatic differentiation and produced felsic magma and dioritic magma respectively. Along with the emplacement and evolution of the magma, the dioritic magma cooled down and crystallized, forming the diorite. A portion of the dioritic magma mixed with the monzogranite magma. Due to the flow of magmas and the physical properties of the magmas (such as viscosity), the dioritic magma was torn into pieces with different sizes accompanying with mixing/mingling with the granitic magma, and finally formed the MMEs in the monzogranite.