Petrogenesis of anatectic granites and restitic granulite enclaves: Implications for disequilibrium partial melting

KAI ZHAO [1], XISHENG XU* [1], SASKIA ERDMANN [1], LEI LIU [1], YAN XIA [1]

[1] State Key Laboratory for Mineral Deposits Research, School of Earth Sciences and Engineering, Nanjing University, Nanjing, 210023, China (*Correspondance: xsxu@nju.edu.cn)

Granulite enclaves on a decimeter to millimeter scale and their host anatectic peraluminous granites (Taima-Dasi and Jiuzhou plutons) from South China provide a window of information into the partial melting process of granitic magmatism. The granulite enclaves are enriched in Al_2O_3, FeO, MgO, TiO_2, and transitional elements, depleted in SiO_2, Na_2O, K_2O, Rb, and show similar zircon Hf-isotopic compositions and coeval formation ages with their host granites, suggesting that they are restites. These restitic granulites have higher Nd-isotopic and more variable Sr-isotopic compositions compared with their isotopically homogeneous granite hosts. The lack of mineral- and outcrop-scale records of magma mixing suggests that the Sr-Nd isotopic characterization cannot be interpreted as a result of injection of mafic magma. The restitic granulites are rich in zirconium and light rare earth elements (LREEs), while the granite hosts show undersaturated feature for these elements. Trace element modeling suggests that source partial melting is non-modal and the melting residue is not in equilibrium with the partial melt. Many restitic peraluminous granulites worldwide have zirconium- and LREE-rich characterization, which implies that disequilibrium partial melting may have played an important role in the formation of granite.