Petrogenesis of Middle Triassic Mafic Microgranular Enclaves and Host Granodiorite in the Eastern Kunlun Orogenic Belt, NW China: Record of Juvenile Lower Crustal Melting and Crust-mantle Interactions at the Paleo-Tethys Ocean Subduction Terminating

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Late Paleozoic-early Mesozoic granodiorite and its mafic microgranular enclaves (MMEs) in the East Kunlun Orogenic Belt (EKOB) documented crucial information about the continental crustal growth, crust-mantle interactions and the Paleo-Tethys ocean evolution. Here we report the zircon U-Pb age, mineral chemistry, whole-rock geochemistry and Sr-Nd-Hf isotope of Yuegelu granodiorite and MMEs in EKOB. The granodiorite and its MMEs emplaced contemporaneously at ca.240 Ma. The host rock shows metaluminous-slight peraluminous and calc-alkalic signatures consistent with typical I- type granite, and has similar rare earth element and trace element patterns to those of average juvenile crust. The MMEs have plastic shapes, mineral assemblage similar to diorite, and abundant plagioclase and quartz xenocrysts. Isotopically, the enclaves have overlapping $(^{87}Sr/^{86}Sr)_i$ (0.70911 ~ 0.71010), $\varepsilon_{Nd(t)}$ (-4.0 ~ -3.1), $\varepsilon_{Hf(t)}$ (-1.8 ~ 1.3) and $T_{2DM}(Hf)$ (1028 ~ 1240 Ma) but an older $T_{2DM}(Nd)$ (2163 Ma and 1155 ~ 1585 Ma) values with their host granodiorite. These geochemical and petrographic signatures suggest that the granodiorite was derived from the partial melting of the juvenile lower crust, and the MMEs were incomplete digested mafic blobs during inhomogeneous mixing between host felsic magma and mafic magma derived from enriched mantle. The magma mixing took placed in the middle crust magma chamber(11 ~ 13 km) at 700 ~ 800 ℃. Mechanical mineral transfer played pivotal roles in magmatic interaction. And geochemical and isotopic diffusion also occurred, but was inhibited by rapid quenching to some extent. The ratio of crustal magma to mantle magma was approximately 4:6 ~ 2:8. These results indicate that the Paleo-Tethys ocean in EKOB was in its terminating of subduction at ca.240 Ma. This study further suggests that the addition of mantle melt during magma mixing took placed in the middle crust may be a vital way of continental crust growth during subduction.