LOMU Geochemical Signiture Of The Cenozoic Ultrapotassic Volcanic Rocks In NE China: Implications For A Relic Ancient Mantle Segment Beneath The Eastern CAOB

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In the past several decades, the Sr-Nd-Pb isotopic features of oceanic basalts have been elegantly described as mixtures of depleted mantle (DMM) and a spectrum of enriched endmember components, such as EM I, EM II and HIMU. The applications of these mantle endmembers in the petrogenesis of basalts in continental tectonic setting have revealed that the EM I signiture is invaribaly related with the cratonic subcontinental lithsophere. In this study, we reported a suite of Pleistocene basic, high potassic to ultrapostassic volcanic rocks from NE China. These rocks are characterized with modal leucite and have SiO_2=42-45%, K_2O=9-11% with K_2O/Na_2O as high as 4. Geochemial data show these rocks are highly enriched in REE with extremely fractionated LREE/HREE ratios (55-70), LILE are also enriched withou apparent HFSE depletion. Though their $^{87}Sr/^{86}Sr$=0.70558-0.70580 and εNd= -5 - -12 demonstrate a typical EM I affinity, it is more accurate to define it as a LOMU signature in terms of Pb isotopes, as these rocks exhibit very low $^{206}Pb/^{204}Pb$ (16.34 – 16.45), $^{207}Pb/^{204}Pb$ (15.27-15.39) which is comparable with other leucite-bearing potassic volanic rocks found elsewhere in the world, such as Leucite Hill and Smoky Butte in North America. We proposed that these potassic rocks were derived from an ancient (Arhcean?) phlogopite-rich garnet facies subcontinental lithopheric mantle which is decoupled from the overlying crust that was formed since Neoproterozoic accompanying with the evolution of CAOB. As two Archean cratons, namly the Aldan Shield and North China cratons exist on the northern and southern side of the CAOB, respectively, it is speculate that the mantle source feeding these potassic rocks is likely a relic cratonic segment of either Aldan or North China cratons.

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Petrogenesis of the Early Paleoproterozoic Garnet-Bearing Monzonite in the Lushan Area, Southern Margin of the North China Craton

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LA-ICP-MS zircon U-Pb dating indicate that the garnet-bearing monzonite, exposed in the Lushan area, southern margin of the North China Craton (NCC), formed at 2134±18Ma. Electron microprobe analyses reveal that the magmatic garnets are homogeneous without substantial chemical zoning. They contain 61.94 to 66.39 mol% almandine, 18.60 to 23.40 mol% grossular, 10.06 to 15.11 mol% pyrope and 1.09 to 4.32 mol% spessartine. They have high CaO and low MnO contents with high Fe/Mn ratios, comparable to those crystallized from high pressure basaltic granulite, but different from those in I, S and A type granites. Garnets have strongly LREE-depleted chondrite-normalized REE patterns with limited HREE variation. The MREE show equally partition between garnet and zircon, whereas HREE prefer zircon to garnet, suggesting crystallizing temperatures at 800 to 850°C. Moreover, in terms of the trace element distribution coefficients between zircon and garnet, our data well agree with experimental data at 800℃ and granulite-facies samples. Considering strongly various HREE/LREE, and low MgO, we envisage that the host melt of garnet might be ever modified by granitic melts.

The monzonite contains SiO_2 from 57.0 to 58.9 wt% with high K_2O+Na_2O contents (7.46 to 9.14 wt%), consistent with intermediate shoshonite series. The calculated magmatic zircon ε_{Hf} (t) values are mostly positive (+0.02 to +4.10) with T_{DM}^C from 2492 to 2388 Ma, except four analyses give negative ε_{Hf} (t) values (-0.97 to -0.98) with T_{DM}^C from 2508 to 2496 Ma, suggesting that they derived from a depleted mantle-derived basaltic source with contamination of older granitic components. On the basis of their high Zr (598 to 926 ppm) and Zr/Y ratios (17 to 21), and enrichments of Rb, Cs, Ba, Hf, Th, U and REE, similar to OIB, we suggest that they have formed in an intra-plate setting, related to lithospheric thinning and asthenospheric mantle upwelling, further constraining that the NCC probably underwent a rifting event during the Paleoproterozoic (2.2 to 1.95 Ga).

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