In situ Os dating of peridotite xenoliths, Tariat, northern Mongolia

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Cenozoic basalts are associated with regional intensive rifting activity across much of Mongolia. The Tariat volcanic field, north of the Hangai Mountains, central Mongolia contains abundant mantle xenoliths. T_{RD} model ages of sulfides in such xenoliths, irrespective of their Re/Os ratios, can provide minimum estimates for the age of the subcontinental lithospheric mantle (SCLM) and record later metasomatic events. Sulfides from the Tariat region have T_{RD} model ages ranging from 1.8~0.5 Ga, with peaks around 1.6, 1.3, 1.0 and 0.6 Ga. These events recognized in the SCLM are consistent with those known in the overlying crust as recorded by Nd model ages of granitoids (1.7~0.7 Ga [1]; 1.4~1.1 Ga [2]) and Hf model ages of detrital zircons [3]. The sulfide age data indicate that parts of the SCLM beneath the region are as old as the oldest known crust in the Precambrian microcontinental blocks (1.8~2.0 Ga) of the Altaid Orogenic belt. Younger sulfide ages may actually date metasomatic events in the SCLM, related to mantle thermal events that affected the overlying crust, including crustal formation in the Altaid Orogen since Paleozoic time.

Spinel lherzolites from the Haer and Zala volcanic centres of the Tariat field represent relatively fertile SCLM. While a small percentage of sulfides show superchondritic $^{187}Os/^{188}Os$ (>0.127), none has $^{187}Os/^{188}Os$ lower than 0.116 (corresponding to T_{DM} = 1.8 Ga [4]). The large range in $^{187}Re/^{188}Os$ (0.036-1.049) may suggest recent addition of Re related to Cenozoic magmatic activity. The least-disturbed sulfide, with $^{187}Re/^{188}Os$=0.036, yield similar T_{MA} and T_{RD} model age of 0.7 ± 0.1 Ga (2σ), marking significant SCLM formation during the Paleozoic Altaid Orogeny. Sulfides with low Re/Os (0.042 and 0.044) and more radiogenic $^{187}Os/^{188}Os$ (0.1293 and 0.1248) suggest the formation of new SCLM from the primitive mantle; this process may be related to Cenozoic rifting and the upwelling of asthenospheric mantle, which cooled to form new, weakly depleted, SCLM [5].

References

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