Micro-scale zircon oxygen isotopic compositions and U-Pb SIMS dating from Dabie-Sulu orogen, China

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More than 150 micro-scale in-site oxygen isotope analyses and U-Pb SIMS dating of eight metamorphic rocks from Dabie-Sulu HP-UHP metamorphic belt have been carried out. The rocks include eclogites, garnet biotite gneiss, granitic gneiss and jadeite quartzite. According to their CL images, two kinds of metamorphic zircon domain could be recognized. One is metamorphic overgrowth, forming either new crystal or complex zircon with metamorphic in rings and protolith inherited in cores. Another one is partial to completely re-crystallized protolith zircons. New growth and completely re-crystallized zircon domains have their HP-UHP ages of 220-250Ma. Partial re-crystallized zircon domains have transitional ages from protolith to metamorphic.

Analytical results show that zircon oxygen isotopes from Dabie-Sulu metamorphic rocks were heterogeneous either in regional or in micro-scale. The total ranges of $\delta^{18}O$ values are from –8.5 to +9.7‰. $\delta^{18}O$ differences could reach 1-12‰ within one sample and 1-10‰ within one grain. Since there are quite large variations of oxygen isotopes, the differences of _ ^{18}O values between ring and core domains of zircons within one sample were not definitely observed.

Combining all zircon U-Pb ages and oxygen isotopes, the most pronounced character of studied samples is that we could divided them to two groups. Five of eight rocks with their protolith ages 1.9Ga- 2.5Ga have $\delta^{18}O$ values of 5.7-7.3‰, whereas other three with protolith ages of 0.7-0.8Ga have their $\delta^{18}O$ values of 1.8 to –0.7‰, much lower than that of mantle-derived magmatic zircons. The anomalous low $\delta^{18}O$ values for both protolith and metamorphic zircons indicated a pre-subduction, pre-UHP metamorphic ages for acquisition of the depleted oxygen isotopic signature and inheritance of protolith zircon_ ^{18}O values during metamorphism. The 0.7-0.8Ga ages of mafic and granitic magmatic activity in Dabie-Sulu area could related to rifting at northern margin of Yantze craton at that time and overlapped with South China Proterozoic glaciation, which may correlated with “snowball” earth of Neoproterozoic. We suggest that the low $\delta^{18}O$ values were in printed on the rocks by high T geothermal system alteration charged with cold meteoric water. It also could be produced by partial melting of altered mafic rocks.

Re-Os dating of arsenopyrites from the Maoling gold deposit, northeast China

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The Maoling gold deposit is located in the Liaodong peninsula, northeast China. The deposit is situated in the Proterozoic Liaodong rift zone close to the north margin of the North China Craton. The deposit is hosted in schist of the Proterozoic Liaohe group. Orebodies are localized by NE-trending shear zones and intersections with secondary faults and folds, and characterized by silicification. The deposit reserves over 25 tons of gold grading 3.2 g/t. Ores contain disseminated arsenopyrite with very fine-grained gold in it and lesser pyrite. Natural gold can be found occasionally. Orebodies and host schist were deformed in the same style.

6 arsenopyrites closely associated with gold mineralization in the Maoling deposit were dated by Re-Os technique. The Os concentrations and isotopic ratios were determined by N-TIMS and Re concentrations ICP-MS. Arsenopyrites from the Maoling deposit contain 0.8 to 6 ppb Re, 25 to 273 ppt Os with $^{187}Re/^{188}Os$ ratio up to 1040 and give an isochron age of 2120±60 Ma with an initial $^{187}Os/^{188}Os$ ratio of 1.87 ±0.15 (MSWD = 0.85).

The result suggests that the deposit was formed at the Proterozoic when the rift was developed, but not related to the Mesozoic granites. The date also provides a constraint for the age of the Liaohe group low-grade metamorphic rocks.