Application of primary geochemical halo to gold exploration at Xincheng gold deposit, China

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Primary geochemical halo is one of the most important development directions of metallogeny to explore more new mineral resources lying deep within the crust, especially to the hidden deposit [1-3]. It is being routinely applied to gold exploration programmes at Xincheng gold deposit with 87 t Au metals, Jiaodong gold province, China. Sampling of fresh rock for multi-element analysis is undertaken in all finished and ongoing exploration engineering, including drilling and galleries. Samples are analyzed by ICP-MS for 18 elements.

The primary geochemical halo zoning sequence suitable for the mining area above -800m level is Au–Ag–Cu–Sb–Bi–Te→As–Pb–Mo→Ba–Se→Mn–Co–Zn–Ni at Xincheng gold deposit. In addition, the primary halo superimposed model from a typical ore body shows that there appear two circumstances between two ore bodies, one is superimposition of the trail halos and the front halos, and the other is the superimposition of the front, trail and near-ore halos. The former might indicate the existence of other ore bodies underneath, whereas the latter might indicate the existence of not only blind ore bodies below the known ore body but also small ore bodies between two large ore bodies. There are coexisting strong anomalies of typical front halo As element and strong anomalies of typical tail halo Mo elements in the primary geochemical halo zoning sequence at Xincheng gold deposit, which can be interpreted as a sign that there is a large extension of gold ore at depth. Some metallogenic prognostic targets delineated on the basis of such consideration were successfully verified.

This research is jointly supported by the National Basic Research Program (No. 2009CB421008), the 111 Project (No. B07011), and China Postdoctoral Science Foundation funded project (No. 20090460400).

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Multistage metamorphic evolution of garnet peridotite from Altyn Tagh UHP terrane, NW China: Records related to slab subduction and exhumation history

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Garnet peridotite associated with garnet pyroxenite, and garnet-bearing felsic gneiss, crops out as lenses in the Proterozoic gneiss from South Altyn Tagh HP-UHP metamorphic belt [1, 2, 3, 4, 5]. Parageneses of minerals from garnet peridotite indicate that the rock has experienced the prograde and retrograde reactions during metamorphism. The pre-subducation stage is represented by relict spinel peridotite assemblage of Ol+Cpx+Opx+Spl as inclusions in garnet, and suggests that the rock was formed at the upper mantle at temperatures as high as about 1100°C. The peak stage is garnet peridotite with a coarse-grained assemblage of Grt+Ol+Opx+Cpx±Mgs. Some exsolution rods of rutile occurred in the Grt. Magnesite is rimmed by dolomite and orthopyroxene and suggesting the peak stage at 3.8-5.1GPa and 880-970°C by P-T estimates. The post-subduction stage is a fine-grained neoblast assemblage of Grt+Ol+Opx+Cpx±Spl±Amp±Prg which indicate the peridotite continued to uplift gradually to the crust and was emplaced in a shallow level of the upper crust.

Mineral parageneses and P-T estimates suggest that previous ultramafic intrusion from the mantle invaded the continental basement and was subducted together with the upper crust to depths over 100 km and experienced ultra-high pressure metamorphic, and then followed by exhumation to the Earth's surface. The multistage metamorphic history indicates that the garnet peridotite preserved a unique subduction and exhumation process at South Altyn Tagh.

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