Hot spring spurted into laterite layer: Geology and geochemistry evidence

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Geology Evidence

Mengman gold deposit in Yunnan province, China is a lateritic deposit. The event that hot spring spurted into laterite layer was discovered when we were engaged in field research based on three geological evidence. First modern hot springs near the deposit region are spurting and spring sediments are rich in gold with an average value of 68 ng/g. Secondly some faults stretched from bed rock to laterite layer. Thirdly gold was very rich not only in the transition belt between weathered bed rock and laterite but also in the very fine particles (less than 200 meshes).

Geochemistry Evidence

In order to verify the hot spring spurting event, two lateritic profiles located within (as P_{in}) and without (as P_{out}) the deposit region respectively were selected and compared on element geochemistry. Three differences on REE, major and minor elements between two profiles were presented. First REE patterns normalized by Post-Archaean average Australian Sedimentary rock (McLennan, 1989) in the P_{out} were all similar, while the patterns in the transition belt between weathered bed rock and laterite were manifestly different from the others in the P_{in} (Figure 1). Secondly the Laterite Index ($LI=(Al_2O_3+Fe_2O_3)/SiO_2$ in molecular propotions of oxides) values in P_{in} were lower than those in P_{out} except in the above 2 meters soils, in which the LI values are similar. Thirdly the rich layer of elements was (Pb, Zn) – (Au) – (As, Sb, Hg) in sequence from bottom to upper in P_{out}, while the sequence was (As, Sb,Hg) – (Au) – (Pb, Zn) in P_{in}. These differences can be well explained by the spurting event.

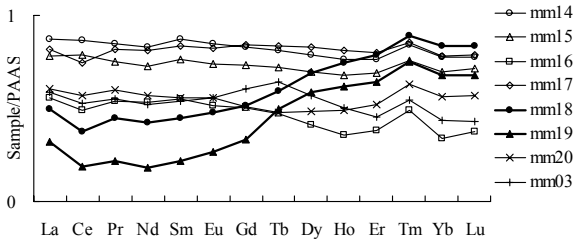

Figure 1: REE patterns normalized by PAAS in P_{in}.

Strontium isotope profiles across ferromanganese nodules from the Gulf of Cadiz (Eastern central Atlantic): Growth history records

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Large Fe-Mn nodule fields have been discovered on the middle continental slope in the Gulf of Cadiz. Nodules are located at the base and flanks of mud-carbonate mounds and mud volcanoes in the Guadalquivir Diapiric Ridge Area [1]. They are essentially composed by Fe-Mn oxyhydroxides derived from the replacement of siderite-rhodochrosite previous concretions.

Equatorial sections of two small sub-spherical nodules were measured for $^{87}Sr/^{86}Sr$ using LA-MC-ICP-MS, across two continuous profiles from the edge to the centre of the samples. In large parts they show the typical composition of modern seawater ($^{87}Sr/^{86}Sr$ = 0.70917). Both nodules display high strontium isotope values (0.70993±0.00025; 0.70992±0.00023) close to the nucleus, and much lower values (0.70724±0.00075; 0.70693±0.00081) in the external parts.

Fe-Mn carbonate nodules grow by early diagenesis bellow the redox boundary close to the sediment-water interface, recording in their layers the strontium isotopic composition of the pore waters. This composition is in general close to the seawater. The high strontium isotopic values could be related to the influence of more radiogenic fluids, probably fuelled by deep-seated fluid venting across the fault systems in the mud volcanoes. These fluids probably are generated by clay minerals dewatering, promoting volcanic activity episodes at the seafloor. The low strontium isotope values of the external edges of the nodules have spatial relation with an alteration front generated after nodule exhumation. The areas of the nodules affected by this alteration front discontinuity could have suffered isotopic exchange with the seawater. In the glacial periods the Mediterranean Outflow Water undercurrent is more active in the area, giving rise to nodule exhumation and printing its strontium isotopic low values in their edges.

[1] González *et al*. (2007) *Episodes* **30**(3), 186-197.