5.2.P13

Pt-Os and Re-Os dating of ores from the Jinchuan Cu-Ni-PGE deposit, a world class Ni deposit

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The Jinchuan Cu-Ni-PGE depost is situated at the southwest margin of the north China craton. Orebodies are hosted by a mafic-ultramafic complex consisting of mainly lherzolite with minor dunite, wehrlite and pyroxenite. The complex covers an area of 1.34 km^2. 48% of the complex is mineralized. Four types of ores were recognized; they are disseminated, disseminated-net-textured, net-textured, and massive ores. The net-textured and massive sulfides were sampled from number two ore body. The net-textured ore reserves over 85.1% of Cu and 85.92% of Ni of the entire deposit, and the massive sulfides 1.1% and 0.59% [1,2].

Six massive ores in the Jinchuan deposit were dated by the Re-Os technique, and five net-textured and two massive ores were dated by the Pt-Os technique[3]. The Os concentrations and isotopic ratios were determined by N-TIMS and Re and Pt concentrations by ICP-MS. The samples contain 44 to 265 ppb Re, 3.6 to 57 ppb Os with $^{187}Re/^{188}Os$ ratios up to 82 and give an isochron age of 852 ±25 Ma with an initial $^{187}Os/^{188}Os$ ratio of 0.255 ± 0.014 (MSWD = 1.7). A 7-point Pt-Os isochron gives an age of 870 ±38 Ma with an initial $^{186}Os/^{188}Os$ ratio of 0.11984 ± 0.00027 (MSWD = 1.4).

The Re-Os and Pt-Os ages agree with each other within uncertainties, suggesting that the Pt-Os isotopic system is capable of dating PGE deposits. The age further suggests that the formation of the Jinchuan deposit maybe related to the magmatism responsible for the break up of the Rodinia supercontinent.

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5.2.P14

The links between the Hongge layered intrusion and Emeishan flood basalts in SW China

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Mafic/ultramafic intrusions in the Pan-Xi area, SW China, occurring along the western margin of the Yangtze block and along N-S-trending, deep faults, are well known in China for hosting numerous Fe-Ti-V deposits and Ni-Cu-PGE mineralization. The Hongge layered intrusion contains a Fe-Ti-V deposit that is the second largest economic concentration of iron and titanium and the largest in terms of contained vanadium reserve of this type in China. The intrusions and Emeishan flood basalts have recently been attributed to the ascent of a mantle plume head. The links between the layered intrusions and Emeishan basalts in the Pan-Xi area, which are critical for the implication with respect to Fe-Ti-V and Ni-Cu-PGE potential of the associated intrusions, are summarized below.

Igneous layering is well developed in the Hongge intrusion and consists of four cyclic units (I-IV). Most of the Emeishan basalts in the Pan-Xi area are characterized by high TiO_2 contents, and those in the Hongge intrusion are even much higher, which imply the high-Ti background of their original magmas. The strong depletion in Cu in some of the basalts and Hongge intrusive rocks is consistent with removal of sulfide from the magma prior to crystallization, which has been related to PGE mineralization in the Hongge intrusion. The E-type Emeishan basalts exhibit enriched Sr-Nd isotopic signatures, elevated La/Sm, Th/Nb, and Th/La, and reduction in Ti/Zr, and Cu/Zr, suggesting that the parental magmas were strongly influenced by crustal material. By contrast, the opposite trend of these ratios and depleted Sr-Nd isotope signatures of the D-type Emeishan basalts are comparable to deeper asthenopheric mantle-plume generated lavas similar to OIB.

The Hongge intrusion may have acted as an open-system conduit (chonolith) through which the lavas erupted. Each cyclic unit resulted from crystal fractionation and the mixing of the new replenishing magma with magma residing in the chamber. The E-type Emeishan basalt magma accounted for the PGE-enriched sulfide layer in Cycle I, whereas the mixing between a primitive, D-type, and the residual, E-type, Emeishan basalt magma generated the PGE-enriched layer in Cycle II and the magnetite layers in Cycles II and III. The equilibration of the Fe-Ti oxide and sulfide liquids with the successive batches of magma (high R-factor) passing through the chonolith enroute to the surface, caused the formation of the giant Fe-Ti-V deposit and a gradual recovery in the Ni, Cu, and PGE contents of the later silicate magmas.