

Some Thoughts on PGEs Enrichment in Porphyry-Skarn Copper Deposits in the Late Mesozoic Middle-Lower Yangtze River Metallogenic Belt (YRMB), Eastern China

Minfang Wang,^{1,2,3*} Jens Gutzmer,^{2,4} Kun Liu,¹ and Wei Wang¹

¹Faculty of Earth Resources, China University of Geosciences, Wuhan, Hubei, 430074, China

²Institute of Mineralogy, Technische Universität Bergakademie Freiberg, 09596 Freiberg, Germany

³State Key Laboratory of Geological Processes and Mineral Resources, China University of Geosciences, Wuhan 430074, China

⁴Helmholtz Zentrum Dresden-Rossendorf, Helmholtz Institute Freiberg for Resource Technology, 09599 Freiberg, Germany

*E-mail, wang_minfang@163.com

The China National Nonferrous Metals Industry Corporation (CNNC) has studied the PGE potential of the Yangtze River metallogenic belt (YRMB), with Pd and Pt enrichment being found in some porphyry skarn deposits, including Fengshan, Tongshankou, Baiyunshan, Tieshan, Tonglushan, Jiguanzui, Taohuazui, and others. Our research at the Fengshan and Tongshankou porphyry skarn deposit has found Pd and Pt enrichment. We postulate that the presence of Pd and Pt associated with calc-alkaline magma in an intracontinental extensional environment requires a different explanation than that of petrogenetic models developed for alkaline arc magmas in island arc environments.

The Pd and Pt contents of flotation concentrate from the Tongshankou and Fengshan deposits are considerably lower than those reported for porphyry deposits from island-arc geotectonic settings. Therefore, we infer that the geotectonic environment is a major controlling factor for the noble metal enrichment of the parent magma as well as its highly oxidized nature. In addition, the parameters for hydrothermal fluids responsible for the formation of the Tongshankou and Fengshan deposits led us to conclude that in case of the Tongshankou deposit, Au, Pt, and Pd were transported as a bisulfide complex, whereas for the Fengshan deposit, Pt and Pd were initially transported as an aqueous chloride complex (during early mineralization stage) and subsequently as a bisulfide complex (in late mineralization stage).

In summary, we think the critical factors controlling Pt and Pd potential in porphyry deposits are as follows: (1) mantle-derived magmas, as a prerequisite for PGE-enriched porphyry deposits; (2) sulfur undersaturation, important for transportation and precipitation of PGEs at later hydrothermal stage; (3) favorable conditions for hydrothermal fluids, including high temperature, high oxygen fugacity (f_{O_2}), high salinity, and low pH.