

Initial approach of the identification criteria system for exploration of porphyry Cu deposits

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Porphyry Cu deposits have caught much more attention in all types of deposits in the past decades. Although numerous studies have been focused on geochronology, origin of ore-forming materials, and fluids, and ore-forming processes of porphyry Cu deposit, however, little connections between these studies and exploration, especially widely used methods such as exploration geochemistry and geophysics, have been established and restricted exploration efficiency. To solve this problem, we propose to establish an identification criteria system for exploration of porphyry Cu deposits (ICEPD).

Based on collecting geological information, geochemical and geophysical data and discovery histories, ICEPD is to find the relationship between geological phenomenon, and geochemical/geophysical data. Using them to establish a combined criteria system to help to identify the porphyry-type mineralization. In initial stage, we choose three deposits from different metallogenic belts, the El Teniente porphyry Cu-Mo-Au deposit in the East Circum Pacific belt, and the Qulong porphyry Cu-Mo deposit in the Tethyan belt, and the Oyu Tolgoi porphyry Cu-Au deposit in the Central Asian belt. Comprehensive comparisons among the characteristics of geology, alteration, geochemistry and exploration methods about these three deposits have been conducted. Some preliminary conclusions have been achieved as follows: the discovery of the relatively shallow-level El Teniente deposit was based on the alteration model of porphyry deposit established by Lowell and Gilbert(1970); the Qulong deposit was successively found by the finding of the external skarn deposit on the basis of the abnormal in the 1:200,000 stream sediment survey; and the discovery of the Oyu Tolgoi deposit is related to highly electronic polarizability of orebody, which can be detected by geophysical methods such as induced polarization(IP), ground magnetic survey and electromagnetic survey. Since both the El Teniente deposit and the Qulong deposit also have abundant sulfides (chalcopyrite, pyrite and molybdenite), we suppose that the high precision magnetic method and induced polarization method may be suitable for their exploration as well. Obviously, the geochemical and geophysical methods in finding different porphyry Cu deposits have variable degree of significances based on their geological features.