Gold Deportment in the Far Southeast Porphyry Cu-Au Deposit, Philippines

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The Far-Southeast porphyry Cu-Au deposit is located in the Cordilleran region of northern Luzon, Philippines. Mineralization is hosted within the Imbanguila quartz diorite and formed at 1.3-1.4 Ma, making it one of the youngest porphyry deposits in the world. Far Southeast Gold Resources Inc., a joint venture company of the Lepanto Consolidated Mining Company and Gold Fields Ltd, recently completed 102 km of underground drilling and confirmed a resource of 892 Mt at 0.7 g/t gold and 0.5 wt% copper. Previous studies have identified native gold as blebs in sulphides, and also proposed the presence of gold micro-inclusions within sulphides. The present study is focused on gold deportment using reflected light microscopy, scanning electron microscopy (SEM) with an energy dispersive analyzer, and laser-ablation inductively coupled-plasma mass spectrometry (LA-ICP-MS). Bornite, chalcopyrite, pyrite, covellite and chalcocite (the latter two replacing bornite) were analyzed in samples that ranged from ~1100 to 1550 m below surface. Gold occurs in or on the margins of sulphides as small (≤10 micrometer-size) gold blebs (with ~8-15 wt% Ag) plus krennerite (Au_3AgTe_8,) and petzite (Ag_3AuTe_2). LA-ICP-MS was conducted on sulphide grains that were free of any SEM-visible mineral inclusions. The results of 28 points on sulphide minerals indicate that gold in sulphides is largely present as micrometer-size inclusions of gold tellurides. Bornite has the highest gold in its crystal structure, up to ~8 ppm; gold content in all other sulphides is <1 ppm. There are locally high trace-element contents in some sulphides, including Pb, Se and Bi, whereas all minerals analyzed contain < 2 ppm As. We conclude that small (mostly ≤10 micrometer, some <1 micrometer) blebs of native gold and gold telluride minerals are responsible for the majority of the gold content in the FSE porphyry deposit. The low gold content in the crystalline structure of sulphides, particularly bornite, along with the presence of numerous micro-inclusions of gold-containing minerals, may be due to exsolution of these minerals from bornite during cooling.