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Abstract:
The Far-Southeast porphyry Cu-Au deposit, northern Luzon, Philippines, is hosted within the Imbanguila diorite – dacite intrusion complex and formed at 1.3-1.4 Ma, making this one of the youngest porphyry deposits in the world. Far Southeast Gold Resources Inc, a joint venture of 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 Au and 0.5 wt% Cu. Previous studies identified native gold as blebs in sulphides, and also proposed the presence of gold micro-inclusions in sulfides. The present study focused on gold deportment using microscopy, SEM with EDS, and LA-ICP-MS. Bornite, chalcopyrite, pyrite, covellite and chalcocite (the latter two replacing bornite) were analyzed in samples that ranged in depth from ~1100 to 1550 m below surface. Gold occurs in or on the margins of sulphides as blebs (<10 um) of native gold (with ~8-15 wt% Ag), krennerite (Au_3AgTe_8) and petzite (Ag_3AuTe_2). LA-ICP-MS analyses of 28 points on sulphide grains that are free of mineral inclusions under SEM indicate that bornite has the highest Au content (≤8 ppm) in its crystal structure; Au in other sulphide minerals is <1 ppm. Locally high Au spikes in bornite are due to micro-inclusions (<1 um), mainly Au tellurides; Te is <1-58 ppm in the crystal structure (i.e., without a discernable phase) and correlates with Au content. High values of Bi (≤ 2160 ppm), Se (≤ 680 ppm) and Pb (≤ 1270 ppm) in bornite tend to correlate; high values of Bi (≤ 482 ppm) and Se (≤685 ppm) in covellite are associated with Pb (≤4 ppm). High Se (133-560 ppm) and Bi (147-5680 ppm) in bornite correlates with high Ag (70-180 ppm). Values of >550 ppm Se and Pb each in sulphides are due to micrometre-size inclusions of clausthalite (PbSe). Sn in bornite is <1 to 22 ppm and in covellite is ≤90 ppm; all sulphides contain <2 ppm Mo and As. We conclude that blebs of native gold and Au tellurides (most ≤10 um to inclusions <1 um in size) are responsible for much of the Au in the deposit.

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