Characterization of igneous rocks in the Hualgayoc mining district, northern Peruvian Cordillera

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The Hualgayoc mining district of northern Peru contains several porphyry Cu-Au, base metal skarn, and high-sulphidation Au deposits, including the Cerro Corona and Tantahuatay mines. The deposits are associated with Miocene intrusions. Available U-Pb zircon ages for the Cerro Corona, Cerro Coymolache and Cerro Tantahuatay suggest that the igneous activity between 14.5 and 13.2 Ma. The Cerro Corona intrusive complex contains at least six injections of of porphyritic diorite. The focus of this study is to examine the six phases of the Cerro Corona complex, and compare them with 10 additional intrusions from the district, to evaluate the rock characteristics and determine the relationship with metal fertility. The intrusion are all dioritic with phenocrysts of plagioclase, hornblende, biotite, and quartz and micro-phenocrysts of magnetite. The majority of the phases are porphyritic in texture, except for the Cerro Quijote intrusion, which is holocrystalline. All intrusions have similar chemical compositions: SiO_2 (59–67 wt%), K_2O (1.4-2.9 wt%), Na_2O (2.0-4.0 wt%) and MgO (1.4-2.2 wt%). They are enriched in LILEs, with high contents of Ba (≤1550 ppm) and Sr (≤856 ppm), and have high Sr/Y ratios (up to 77) and relatively low Y concentrations (10-15 ppm). High Sr concentrations are attributed to the abundance of plagioclase because Sr and Ca are positively correlated. The phases also have high LREE concentrations ([La]n/[Yb]n=10 to 17) with weak, positive Eu anomalies (0.8 and 1.11). The Las Gordas intrusion, however, contains lower REE contents than the other intrusions and has a more fractionated REE pattern ([La]n/[Yb]n=24). Our earlier results by Morfin et al. (2016) indicate extremely high Ce^{4+}/Ce^{3+}(> 400) in zircon from the Cerro Corona, Cerro Caballerisa and Choro Blanco intrusions, and moderately high ratios (200-300) from the San Nicolas, Cerro Jesus and Las Gordas intrusions. The high ratios indicate intrinsically oxidized parental magma, which is consistent with the abundance of primary magnetite that has partially commonly been replaced by hematite. Phyllic alteration is prevalent in most of the intrusions, where high-temperature potassic alteration is only evident in the Cerro Corona intrusion, in which secondary K-feldspar and biotite formed after primary plagioclase and hornblende.