

206 - Magmas responsible for the porphyry Cu-Au mineralization at Dizon Mine in the ancestral Pinatubo volcano, Philippines

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The Dizon porphyry Cu-Au mine (0.67 Mt Cu, 174 t Au) is located within the ancestral Pinatubo volcano of the Luzon arc, Luzon Island, Philippines. Mineralization at Dizon is hosted in quartz diorite porphyry of 2.5 ± 0.2 Ma which intruded Late Miocene dacite-andesite eruption products of the volcano. Chalcopyrite and minor bornite occur predominantly in quartz-magnetite veins which are accompanied by biotite and chlorite alteration halo. This was overprinted by alteration forming white mica, chlorite and pyrite. The Dizon deposit shows abundant evidence for multiple injections of hot mafic magmas including destabilization of plagioclase, presence of basalt enclaves, and a pyroxene-rich diorite phase, which indicates the equilibrium at $\sim 986^\circ\text{C}$ and ~ 470 MPa. Composition of igneous amphibole in andesite and diorite yields high water contents of parental magmas (5.8 and 7.1 wt%), high $f\text{O}_2$ (FMQ +2.6 to +2.8 and FMQ +1.8 to +2.1), and temperatures of $\sim 817^\circ\text{C}$ and $\sim 986^\circ\text{C}$, respectively. Fe-Ti oxides in the andesite confirm a highly oxidized parental magma, FMQ +3.0 to +3.3 with temperature $\sim 830^\circ\text{C}$, both slightly higher than amphibole results. The magma conditions responsible for Cu-Au mineralization at Dizon are remarkably similar to those of the Pinatubo 1991 eruption products of dacite, which had $f\text{O}_2$ of FMQ +3.1 to +3.2. The data suggest supply of oxidised melt to the volcano for a period over ~ 3 m.y.

Furthermore, the oxidized magma conditions and temperatures at Pinatubo are similar to those associated with porphyry Cu deposits elsewhere, including the Bingham Canyon, El Salvador and Yerington deposits.