Ni-Cu-PGE Sulphide Mineralization Associated to Mafic Cumulates: the Case of Aguablanca, SW Spain.

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Aguablanca is an economic Ni-Cu-PGE sulphide deposit with geologically estimated reserves of 35 Mt grading 0.7 %Ni, 0.6%Cu and 0.75 ppm Pt+Pd+Au. The ore is hosted by gabbroic cumulates of the late Variscan Santa Olalla Plutonic Complex (SW Spain). The mineralization is located in two subvertical lenses that contain disseminated sulphides grading into massive ore, often cross-cut by chalcopyrite-bearing veins. The mafic igneous rocks exhibit a pervasive alteration to a calcite + epidote assemblage.

The ore mineralogy consists of coarse crystals of pyrrhotite with exsolutions of pentlandite, anhedral chalcopyrite and platinum group minerals (PGM) that include merenskyite, moncheite, palladian melonite and sperrylite hosted by sulphides. Locally, the ore has undergone brecciation along with intense replacement of pyrrhotite by pyrite. In the brecciated areas, PGM occur both within sulphides and in the contact between mineral phases.

The observed mineral assemblages are the result of a complex evolution through four stages: 1) magmatic crystallization of a monosulphide solid solution at high temperature; 2) subsolidus recrystallization during subsequent cooling; 3) brecciation and hydrothermal precipitation of pyrite; and 4) supergene alteration of primary ores. Therefore, Aguablanca is a mineralization formed by magmatic processes, now exhibiting reequilibration mineralogy and textures. PGE distribution was mainly controled by the magmatic sulphide-rich liquid. However, some hydrothermal remobilization could have occur during the brecciation of the ores.