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# Textural development in sulfide-matrix ore breccias in the Aguablanca Ni-Cu deposit, Spain, revealed by X-ray fluorescence microscopy

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## Abstract

The intrusion-hosted Ni-Cu sulfide deposit at Aguablanca in south-western Spain contains a high proportion of ores in the form of sulfide-matrix ore breccias. These are polymict, with autolith and xenolith inclusions in sulfide-rich and/or sulfide-poor matrices. Inclusion lithologies include calc-silicate skarn rocks from the adjacent marbles, ultramafic and mafic cumulates, and remelted and recrystallized mafic rocks containing spinifex-like textures.

Breccia textures have been investigated at mm to cm scale using desk-top and synchrotron-based microbeam XRF mapping which reveals a number of distinctive common features: disaggregation of inclusions into adjacent sulfide along original silicate grain boundaries; complex reverse and oscillatory zoning in Cr content of clinopyroxene grains within sulfide and inside inclusions; narrow reaction rims between country rock clasts and enclosing silicates; and preferential disposition of pyroxene crystals within pyrrhotite-pentlandite aggregates (original MSS) relative to inclusion-poor chalcopyrite.

The observed range of textures is explained by a model of percolation of molten sulfide through a pre-existing silicate-matrix intrusion breccia, preferentially displacing a cotectic or eutectic plagioclase-pyroxene melt. The process is analogous to that believed to have formed interspinifex ore in komatiite-hosted deposits, and also to that responsible for superficially similar sulfide matrix ore breccias at Voisey's Bay. The preserved range of textures is interpreted as being due to late stage gravity-driven percolation of sulfide liquid from above into a pre-existing partially molten intrusion breccia. This intrusion breccia itself may have been emplaced into the neck of the Aguablanca stock, in the waning stages of magma flow.

*Keywords: Nickel, magmatic sulfide, intrusion, emplacement, infiltration, percolation*