

Nickel Enrichment in Outokumpu-Type VMS Deposits: Reclassifying Ore Body Deposition

Jacob Sutton¹, Andrew Martin¹

¹UNLV, Las Vegas, United States

The green energy transition and increased manufacturing of electric vehicle has made Ni extraction a top priority. Increasing Ni demand warrants the reinvestigation of ore bodies enriched in Ni to improve exploration and mining practices. We reassess mechanisms of Ni enrichment in Outokumpu, an ultramafic-hosted volcanogenic massive sulfide (VMS) deposit in Finland, and the type locality of “Outokumpu-type” VMS deposits globally. Using detailed mineralogy and in situ geochemistry, we test if Ni enrichment occurred on the seafloor or during later metamorphism. Deposit mineralogy is dominated by pyrrhotite, chalcopyrite and lesser amounts of pyrite, sphalerite, chromite, isocubanite and galena. Nickel occurs as discrete Co-pentlandite grains associated with pyrrhotite. In combination with new data from unmetamorphosed on-land analogues and the discovery of ultramafic-hosted seafloor massive sulfide (SMS) deposits, our data suggests that two-stages of Ni enrichment are not required, and the formation of Outokumpu-type deposits is analogous to actively forming ultramafic SMS deposits.