## Cobalt Enrichment in Sulfides from Iron Oxide Copper-Gold Mount Colin Deposit, NW Queensland

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Iron Oxide Copper-Gold (IOCG) deposits have traditionally been associated with production of copper, gold and iron; however, it is known that they can have a wide range of endowments, including potential for many critical metals. In this context, cobalt has recently attracted considerable interest among researchers, as understanding its occurrence is crucial for both scientific and economic reasons. While the number of publications studying cobalt endowment has grown, most studies have focused on other types of hydrothermal deposits. In this study, we analyzed samples from the Mount Colin IOCG deposit located in the Mount Isa Inlier, Cloncurry province, NW Queensland, where pyrite represents the main cobalt-bearing phase. A combination of petrography, EPMA imaging, LA-ICP-MS and EPMA spot analyses were employed to conduct a detailed mineralogical investigation of the sulfides. Three main forms of Co-rich distribution have been identified including: (1) pyrite presenting core-mantle-rim textures with variation in concentrations, (2) pyrite with a more irregular zoning, and (3) nano-inclusions within the sulfides. Results from the EPMA analysis show cobalt contents ranging from 0.01 to 3.6 wt%. LA-ICP-MS trace element data illustrates that Co-rich pyrites can reach concentrations up to 32056 ppm, with the highest averages associated with the first type of distribution. EPMA elemental maps reveal that the Co-rich inclusions also show higher concentrations of Ni, a behavior not observed in other cobalt enrichments, which typically vary between Co-rich/Ni-poor and Co-poor/Ni-rich compositions. EPMA data confirmed the high concentrations of Ni on some of the inclusions, possibly indicating the presence of cobalt-nickel sulfides. This would indicate more than one form of cobalt occurrence in this deposit. Understanding the Co-Ni enrichment patterns provides insights into the ore-forming processes, while the characterization of the textures and inclusions provides insights into the hydrothermal activity and possible overprinting from multiple mineralizing events at Mount Colin deposit.