

Occurrence and Spatial Distribution of Cobalt in Skarn Deposits: A Case Study from the Middle-Lower Yangtze River Valley Metallogenic Belt (MLYB) in East China

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Critical metals, including cobalt, are strategic and key mineral resources that have attracted global attention. Hydrothermal ore deposits, such as skarn and porphyry deposits, contain variable amounts of critical metals and have the potential for usage. The Mesozoic MLYB in east China is part of the circum-Pacific metallogenic belt and hosts a large number of porphyry-skarn Cu-Fe-Au deposits. Critical resources, including Co, Cr, Se, Re, and Te, are produced in these deposits in addition to bulk metals such as Cu, Ag, Fe, and S-rich ores. The subsequent by-product critical metals differ according to the dominant metals in skarn deposits. Most critical metals are hosted in sulfides in these skarn deposits, especially in pyrite in the skarn iron deposits. The average grades of cobalt in the skarn iron deposits are 0.01% to 0.03%, and some iron deposits are estimated to contain more than 10,000 tons of associated cobalt resources. The cobalt content also varies greatly in host minerals, such as pyrite, where Co^{2+} replaces Fe^{2+} in the form of isomorphism. The cobalt content in the same pyrite particle often changes by two to three orders of magnitude, and cobalt can be abnormally enriched in a single pyrite grain or ring rather than the core. Independent cobalt minerals are also developed in the deposit and account for approximately 10 to 15% of the cobalt in the whole deposit. Cobalt can be distributed in the iron orebodies and can also concentrate in the upper portion or upon of the iron bodies in the quartz-pyrite alteration zone. The recovery and utilization of cobalt in skarn deposits still requires further research and technological improvements. However, our pilot study indicates a broad future for this type of cobalt resource.

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