

Deposit Characterization of Emerald-Bearing Systems in the Chivor Formation, Eastern Emerald Belt, Colombia

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The Eastern Emerald Belt of Colombia hosts some of the world's highest-quality emerald deposits; however, detailed mineralogical and geochemical characterization of emerald-bearing systems remains limited, particularly within the Chivor Formation across areas of the municipalities of Macanal, Chivor, Somondoco, and surrounding zones (Boyacá). This gap restricts a comprehensive understanding of emerald genesis and associated hydrothermal processes in structurally complex geological settings.

This study aims to improve deposit characterization through an integrated lithological, mineralogical, and geochemical approach. Pre-existing samples from productive veins and altered host rocks are analyzed using X-ray diffraction (XRD), X-ray fluorescence (XRF), and petrographic thin section analysis. These techniques enable the identification of mineral assemblages, textural relationships, and trace element distributions, with particular emphasis on chromium (Cr), vanadium (V), and iron (Fe), which play a critical role in emerald formation.

The integration of these datasets allows the recognition of compositional patterns and diagnostic mineral associations that can be used as reliable exploration criteria in emerald-bearing systems. Furthermore, the study provides constraints for developing a preliminary genetic model that links hydrothermal alteration processes with mineralization stages in the Chivor Formation.

The expected results contribute to strengthening the geological understanding of Colombian emerald deposits and provide practical inputs for more efficient, data-driven, and sustainable exploration strategies in similar geological environments.