

## **Geochemical Comparison of Trapiche and Non-Trapiche Emeralds From the Muzo District, Colombia**

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Colombian trapiche emeralds, primarily sourced from the western emerald zone including the Muzo district, are unique mineralogical curiosities characterized by a central core, six arms, and distinct dendrites. While both trapiche and non-trapiche emeralds in this region form within black shales under hydrothermal-sedimentary conditions, the specific mechanisms governing their textural and chemical differences remain a subject of active research. Trapiche formation is closely linked to sudden fluid decompression and local supersaturation, whereas non-trapiche emeralds typically form under a progressive decrease in pressure and fluid flow. This study aims to evaluate and compare the geochemical signatures of trapiche emeralds and conventional non-trapiche emeralds from the Muzo mining district. By utilizing infrared spectroscopy, this research investigates the molecular composition and structurally bound fluid constituents within the different crystal sectors. The primary objective is to determine if the abrupt decompression and fluid overpressure responsible for the trapiche texture also impart a distinct spectroscopic and geochemical fingerprint compared to standard emeralds precipitating in the same broad geological environment. By analyzing the distribution of specific molecular signatures across the core, arms, and overgrowth of trapiche samples versus euhedral non-trapiche crystals, this study provides new insights into the fluid evolution and growth history of these deposits. The findings will contribute to a deeper understanding of deposit characterization in the Eastern Cordillera Basin, potentially offering new geochemical parameters to trace localized fluid pressure variations during emerald mineralization.