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Anglesite-Bearing Polymetallic Hydrothermal-Shear Breccia in the Paja Formation, Eastern Cordillera of Colombia

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Hydrothermal polymetallic occurrences in Colombia are commonly associated with volcanic-geothermal systems in collisional settings related to arc magmatism. Sediment-hosted and stratigraphically bounded mineralizations are sparsely distributed and fluid sources are still in debate due to lack of systematic data. Here we report an explosive breccia in a right-lateral shear system, bounded by two 20-cm levels extremely rich in organic matter in fissile black shales from the lower Albian from the Paja Formation, biostratigraphically dated with Dufrenoyia specimen samples from a facially correlated level 2 km from the main locality. The breccia is composed of angular fragments of carbonized organic matter, vitrinite, anglesite, malachite, sphalerite, Fe-oxides, and fuchsite. The paragenetic association, including Pb-Cu-Zn and Cr minerals with carbonate, sulfur, and carbonate anionic groups, indicates the interaction of a hydrothermal fluid with organic-rich levels in the shales.

Low-temperature associations give insights into a closed circulation convective system, cracking open shear faults crosscutting the strata and carrying fluids in between carbonized organic matter as mineralized breccias that crystallized in shallow levels and chemically do not require external fluid fertile sources. Field geology, thin section and charcoal maceral petrography, structural analysis, Raman spectroscopy, EPMA, and geochemical analysis let us conclude that organic-rich levels from black shales facies of the upper segment of the Paja Formation hold significantly metallic and REE elements in non-conventional geologic settings. Cr-rich shales can be used as a pathfinder and vectoring mechanisms for fluid transiting to upper stratigraphic levels of facially connected structures with favorable permeability settings, as reported near Zn-Pb vein-breccias. This study serves as a first report on polymetallic mineralizations on shale with proper stratigraphic, structural, and fluid properties description in order to explore for strategic resources in suitable settings from nearby rocks in the Eastern Cordillera.