

Mineralogical, petrographic, and geochemical analyzes which confirm the hydrothermal origin of the sediments that overlie the peridotites of Cerro Matoso, Colombia

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Abstract

The Cerro Matoso deposit, one of the largest open-pit ferronickel mines in the world is formed by a sedimentary succession on top of an abducted ultramafic body that makes part of the Cauca ophiolite complex. The set of rocks was accreted in northwestern Colombia during the Cretaceous and exposed to weathering processes during the last Andean Orogeny. Sediment samples were collected and studied using petrographic microscopy, SEM, EPMA, ICP-MS, XRF, and oxygen as well as carbon isotopes analyses. Oxygen isotope results reflect pore-water temperatures reaching up to 130°C during mineral precipitation, which are consistent with serpentinization-derived fluids of mantle rocks that may be related to deep-sea hydrothermal activity. Negative $\delta^{13}\text{C}$ values (–27.1 to –1‰ V-PDB) in bulk samples of the tabular succession correlate with the $\delta^{13}\text{C}$ range of methane from modern serpentinite-derived fluids. The REE/Fe data (ratio <0.4) suggest that sediments differenced in black mudstone and fossiliferous green claystone correspond to metalliferous and hydrothermal sediments respectively, formed in the ancient mid-ocean Pacific ridge, far west of its present position. Positive Eu and negative Ce anomalies registered in the black mudstone succession correlate with a hydrothermal plume scenario.

Keywords: Oxygen and carbon isotopes; Methane; REE; Hydrothermal vent systems; Nickel laterites.

Análisis mineralógicos, petrográficos y geoquímicos confirman el origen hidrotermal de sedimentos metalíferos sobreyaciendo las peridotitas de Cerro Matoso, Colombia

Resumen

El yacimiento Cerro Matoso, una de las minas de ferroníquel a cielo abierto más grandes del mundo, está formado por una sucesión sedimentaria que reposa sobre un cuerpo ultramáfico adosado al continente, que forma parte del Complejo Ofiolítico del Cauca. El conjunto de rocas fue adosado en el noroeste de Colombia durante el Cretácico, y fue expuesto a procesos de meteorización durante la última

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