

SCIENTIFIC COMMUNICATIONS

NEW FIELD EVIDENCE BEARING ON THE ORIGIN OF THE EL LACO MAGNETITE DEPOSIT, NORTHERN CHILE

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Abstract

The El Laco magnetite deposit has been interpreted as lava flows and feeder dikes formed from iron oxide magma, but more recently, as a product of metasomatic replacement. Open-pit exposure created at Laco Sur during the 1990s reveals that the massive magnetite contains magnetite-veined blocks and smaller fragments of altered andesitic volcanic rock, clearly supporting the replacement origin. Open-space growth of magnetite and pyroxene along the walls of chimney structures and veins within magnetite indicates precipitation from aqueous fluid, rather than from gas alone. The native sulfur-bearing, cristobalite-alunite alteration widespread at El Laco, and broadly contemporaneous with magnetite formation, is recognized as part of a steam-heated horizon generated in the vadose zone above a paleowater table. Consequently, the magnetite replacement must have taken place beneath the paleowater table, but probably <300 m beneath the paleosurface. Thus, magnetite deposition at or immediately beneath the paleosurface is precluded. The main outstanding question is how hot hypersaline brine, the probable ore-forming fluid at El Laco, attained such shallow crustal levels within a high volcanic edifice without undergoing the extensive groundwater dilution documented from most shallowly preserved hydrothermal systems.