



REE+Y DISTRIBUTION IN IRON FORMATIONS FROM CARAJÁS, AMAZON CRATON, BRAZIL

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Iron Formations (IFs) from the Carajás Mineral Province (CMP) are the protolith of the world-class iron deposits of this unique polymetallic province. They consist of important paleoenvironmental and regional geodynamic markers around the Neoproterozoic-Paleoproterozoic transition. Here we present the results of 27 high-resolution trace element analyses of banded iron formation (BIFs) from Carajás. The samples include 10 bulk BIFs and 17 individual mesobands (2- 3 cm thick). The iron-oxide and silica individual bands were microdrilled in order to investigate geochemical variations at the centimeter scale. The studied samples show a set of mineral assemblage and textural/structural features usually not altered by post-depositional processes. The low contents of less-mobile elements (e.g., Al, Zr, Th, Hf, Ti) show the largely detritus-free nature of the Carajás IFs. Their positive shale-normalized (subscript SN) La and Gd anomalies are similar to those of modern seawater. The IF also display large positive chondrite-normalized (subscript CN) Eu anomalies, reflecting the influence of high-temperature hydrothermal vents and bottom solutions. The typical super-chondritic Y/Ho and Zr/Hf ratios shown by Carajás IFs suggest open ocean environments, since these ratios commonly increase from coastal to open ocean seawater due to preferential sorption of Hf and Ho over Zr and Y, respectively, onto particulate Fe- (oxyhydr)oxide surfaces. But, in contrast to modern seawater and to other detritus-free IFs, the Carajás IFs do not show the typical heavy rare earth element (REE) enrichment relative to light REE. They may show variable light to heavy REE fractionation trends or even LREE enrichment. The Th/U ratios of both bulk BIFs and microdrilled mesobands are generally lower than the upper-crustal ratio. While the bulk BIFs show mostly chondritic values, the individual Fe and Si bands exhibit higher ratios. The general absence of negative Ce_{SN} anomalies attests for rather reducing paleoenvironmental conditions. Unlike the great majority of the data that lack negative anomalies of Ce, a few samples do display such anomalies, possibly due to local post-depositional oxidizing alteration. These few samples, in turn, are in agreement with the low Th/U ratios shown by most the Carajás IFs. Such low Th/U ratios may indicate oxidizing transitional conditions during terrestrial weathering, which cause preferential U input into the ocean in response to the oxidation of immobile U⁴⁺ to more mobile U⁶⁺.

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