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BIOGEOCHEMICAL SIGNATURES OF THE QUATERNARY IRONSTONES OF THE XINGU RIVER

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In the Brazilian Amazonian, ironstone deposits develop on the bed and banks of the Xingu River. Their main lithotype are the ferruginous laminites which are directly or indirectly formed by the action of iron bacteria. Mineralogical and chemical analysis showed that although goethite is the main mineral and being well preserved, its small size with nanorod shape, in addition to several isomorphic substitutions of Fe with Al, Si, P, K, Mn, Ba, Sr, and Ca are indicative of very early transformation of the original precipitate, an unstable hydrous ferrous oxide mineral, into goethite. The main biosignatures found were: 1) microbial remains like tubular microbial filaments (more abundant), and coccoid, barrel-shaped to rounded rod-like cells (less common); 2) thin and wavy laminations, forming domes and columns, in different scales; 3) presence of biofilms of amorphous extracellular polymeric substances, secreted by many kinds of microbes; 4) detrital quartz and kaolinite immersed in the ferruginous crust as if trapping originally binding microbial mats; 5) presence of kerogen within laminae. The ages obtained through the methods of (U-Th)/He in goethite and optically stimulated luminescence in quartz indicate that they are Quaternary deposits, resulting in the first record of ferruginous microbialite in a modern freshwater system in South America. Despite their biogenic origin having been demonstrated, it is important to identify geochemical signatures related to the biogenic and abiogenic phases of these deposits. The biomineralization of Fe by iron-aerobic bacteria occurs through metabolic interaction with the environment, which may, for example, increase or decrease the concentration of soluble metals. To date, inductively coupled plasma mass spectrometry, X-ray fluorescence, and microprobe analyses are being carried out to respond to the raised hypothesis. In addition, this research helps to decipher the evolution of the great Amazonian drainages. Another relevant aspect of the research is that the association of microbes and iron accumulations on Earth will serve as a prospect