Prebiotic chemistry in iron-rich water medium: Fixation of cyanide as Prussian Blue

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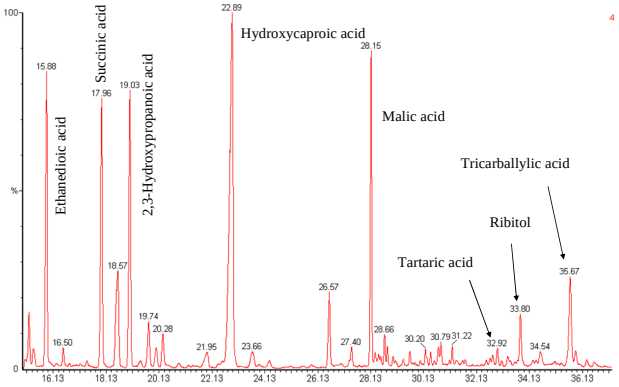
Water based aerosols are ubiquitous in the actual troposphere and it has been suggested that they could play an important role as prebiotic micro-reactors in the origin of life. The salinity and pH of the aqueous phase may have an important influence in the gas-liquid interfaces, which are expected to be special sites for relevant prebiotic reactions (1). The presence of the Archean banded iron formations strongly suggests that dissolved iron (ferrous ion) was present in high quantities in the ancient sea and it has been postulated that the ancient sea had a salinity of the 1.5 to 2 times the modern value and its pH ranged between 4 to 10 (depending of the author).

In this work, we explore the effects of pH (between 5.8 to 9.8) in the generation of biomolecules in prebiotic simulation experiments using aqueous aerosols of saline iron rich solutions and spark discharges in a suitable prebiotic atmosphere.

In all experiments, we observed that the presence of ferrous iron leads the formation of Prussian Blue, a strongly reduction the final pH of the aqueous pool and the lack of small molecules in the raw of reaction. Under the assayed conditions the Strecker reaction is inhibited and the formation of heterocycles is stopped but a rich mixture of carboxylic acids is obtained (Fig. 1). Therefore, independently of the pH, in the studied range, the ferrous ion seems to have an important influence in the formation of the organics and their precursors.



Reference

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Differences in REE distribution patterns of the fault tectonites in the Huize Carbonate-hosted Zn-Pb-(Ag-Ge) district, Yunnan, China

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The Huize Zn-Pb-(Ag-Ge) district is a typical representative in the Sichuan-Yunnan-Guizhou metallogenic region. Two groups of NE-, NW-extending fault structures are mostly developed. The Lower Carboniferous Baizuo Formation (C_1b) is the most important ore-hosted stratum.

Differences in REE distribution patterns of the fault tectonites are closely related to the lithologic character of the protolith, the extent of water/rock interaction and faults' differences in their mechanics properties. As for the protoliths of the same lighologic character, the extent of fluid/tectonite interaction and the mechanics properties of faults are the two major factors affecting REE distribution patterns. Tectonic activities occurred mainly during the metallogenic stage. Differently trending fault tectonites belong to different types owing to different tectonic properties, so there would be some difference in the extent of interaction of fluids with the rocks, as well as in their REE composition and REE distribution patterns. The NE-trending faults are compression-compresso-shear faults, where mineralized cataclastic (clastoporphyritic) rocks, clastic rocks and mylonite were dominated and their forming environment was relatively reductive relative to the NW-trending fault zone, unfavorable to the interaction of ore fluids with rocks. So, the rocks there are relatively enriched in HREE and show a variety of REE distribution patterns: Eu-enrichment type and Eu-depletion type; the NW-trending faults are of tensile nature during the metallogenesis, mostly characterized by mechanical destruction and the formation of breccia, cataclastic (clastoporphyritic) rocks and similar REE distribution pattern (LREE-enrichment-HREE-flat type) to those of strata (C_1b).

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