

Gradients Drive Prebiotic Chemistry in Vents

Researchers from the NAI JPL Icy Worlds team report that gradients of redox and pH in iron minerals can drive the formation of prebiotic organic molecules.

The early Earth had no atmospheric O_2 – which resulted in an ocean where iron could remain dissolved in the ocean and precipitate as highly reactive minerals. These *iron hydroxides* in seafloor sediments and hydrothermal chimneys range from more oxidized (red rust) to more reduced (green rust) – each having different ability to catalyze organic prebiotic reactions.

Simple organic precursors (in this case, pyruvate) can react with iron minerals and ammonia to make the building blocks of life, but **the reaction outcome depends on how much oxygen is present.**

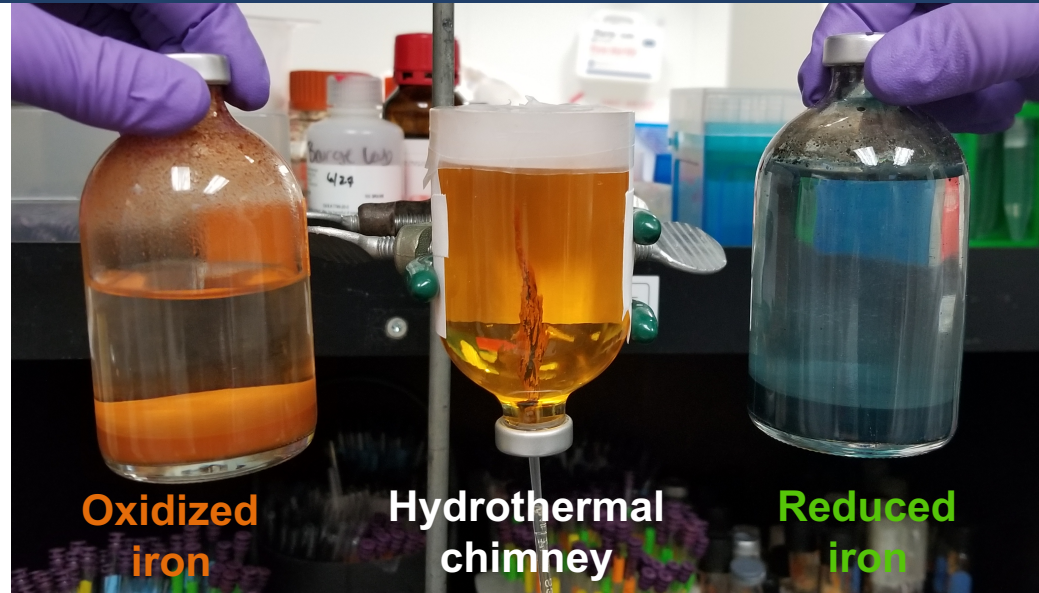


Image credit: L. Barge / NASA JPL

Partially oxidized iron minerals yield abiotic amino acid formation.

This reaction could occur on iron-rich early Earth seafloors, in vents, and also in any planetary environment where similar iron minerals may occur – such as Enceladus, Europa, or the subsurface of Mars.

