

Mineral-Driven Metabolism

Experiments in early Earth conditions, undertaken to understand early metabolic processes, have shown that minerals can serve a catalytic role for key redox reactions.

- The first pre- and proto-metabolic reactions likely involved interactions with the geological environment; however, it is not known to what extent minerals and dissolved inorganic ions could have facilitated the evolution of biochemical reactions on Earth or other planetary bodies. It has been proposed that minerals could have served as the first “enzymes” before the evolution of proteins, perhaps why enzymes today contain metal clusters (e.g. FeS).
- This study explored whether the ubiquitous, enzymatically-driven reduction of NAD⁺ (nicotinamide adenine dinucleotide) converts to NADH could have been originally mediated by minerals under early Earth conditions and showed that this reaction occurred only when FeS minerals were present, thus the minerals were acting as the “proto redox enzyme”.
- Since this important metabolic reaction could be mediated by minerals, this research sheds new light on possible processes for the origins of life on Earth and other worlds.

