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Geochemistry of chemical sediments from Piumhi greenstone belt - MG

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Abstract
The paleochemistry and redox evolution of Eath's oceans has long been debated in the literature. REE+Y composition of chemical sediments provides a record of those conditions. This work identifies anomalies indicative of an oxygenated hydrosphere influenced by hydrothermal processes, with iron formation (IF) deposition roughly at the redoxcline of a stratified ocean basin.

Key words: Geochemistry, REE+Y systematics, palaoenvironment

Introduction

Trace element systematics in marine sedimentary rocks provides a powerful tool to investigate the process controlling seawater geochemistry. Rocks like cherts and iron formations provide a record of seawater composition in the time of their precipitation, offering unique information about the history of geochemical change in Earth's oceans. REE+Y patterns are particularly useful as proxies for geochemical conditions and mechanisms for IF deposition.

Results and Discussion

In this study, 15 samples of cherts and iron formations were collected in the Piumhi greenstone belt. Major elements were determined by XRF, and trace elements by ICP-MS. Due to analytical problems, the 4 chert samples collected could not be used. One sample was excluded from interpretation based on high Th, Zr and erratic post-Archean shale standard (PASS) normalized REE+Y pattern.

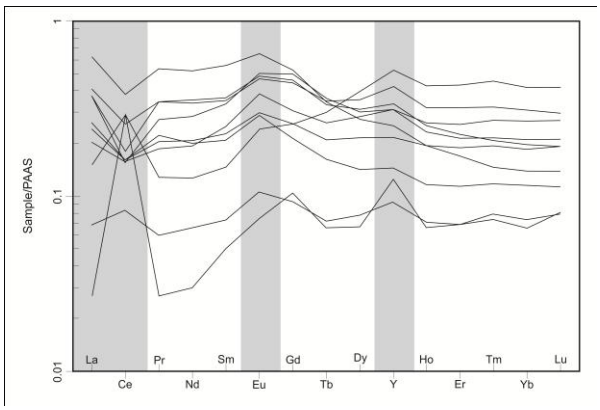

Image 1. PAAS normalized REE+Y pattern from IF samples.

Image 1 show the PAAS normalized REE+Y pattern for the remaining 10 samples. Most samples show negative Ce anomalies and positive Eu and Y anomalies. The negative Ce anomalies are consistent with oxidizing water column. The positive Eu anomaly suggests contribution of a reducing hydrothermal fluid and the observed Y anomaly is analogous to modern oceans. The positive Ce anomalies that occur in some samples can be explained by an anoxic hydrosphere.

Chart 1. REE+Y anomalies from IF samples.

Amostra	La/La*	Ce/Ce*	Pr/Pr*	Eu/Eu*	Gd/Gd*	Y/Ho	PrSN/YbSN	Lu/Lu*
PB-01A	1.13	2.08	0.62	1.24	0.95	33.68	0.28	1.01
PB-01B	1.11	0.50	1.30	1.38	1.34	36.55	1.67	1.07
PB-01C	1.18	0.68	1.15	1.35	1.27	36.03	1.06	0.98
PB-01D	1.07	0.66	1.20	1.35	1.26	34.96	3.69	1.12
PB-02A	1.43	1.30	0.80	1.48	1.23	35.70	0.75	1.05
PB-02B	1.47	0.46	1.26	1.49	1.56	37.32	1.29	1.02
PB-04	1.27	10.50	0.17	1.35	1.77	51.11	0.36	1.28
PB-05	1.01	0.66	1.22	1.52	1.22	33.90	1.92	0.98
PB-06A	1.16	0.80	1.07	1.53	1.15	32.53	0.69	0.99
PB-06B	1.21	0.72	1.11	1.37	1.17	30.42	1.05	1.04

Conclusions

The described REE+Y anomalies are consistent with an oxidizing environment, influenced by hydrothermal fluxes. The observed patterns are very similar to the proposed by Planavsky et. al. (2010) to late Paleoproterozic basins, at a depth corresponding to the redoxcline of a stratified ocean basin.

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