Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.11676

# Geochemical and mineralogical investigations of seafloor oxyhydroxides deposits collected in Mid-Atlantic Ridge hydrothermal fields

**MR. PEDRO ROSEIRA REIS COSTA**[1] AND DR. ÁGATA ALVEIRINHO DIAS, PHD[2]

[1]University of Saint Joseph
[2]Instituto Dom Luiz (IDL), Faculty of Sciences, University of Lisbon

Presenting Author: 201800459@usj.edu.mo

Manganese and ferromanganese oxyhydroxide (OH) deposits are typically rich in Fe ($Fe^{2+}$ or $Fe^{3+}$) and/or Mn ($Mn^{2+}$, $Mn^{3+}$ or $Mn^{4+}$) associated with aqueous environments. In the oceans, they usually occur as nodules, crusts, and massive beds. They can be formed by diagenetic, hydrogenetic, hydrothermal, or mixed-processes [1]. Hydrothermal OH deposits can occur in a range of neotectonics settings such as mid-ocean ridges, back-arc spreading centers, and active submarine volcanoes [2,3,4]. They may form layered deposits, crusts coating or filling cracks on the basement rocks, or hydrothermal vent structures [5,6]. Although associated to hydrothermal systems, they can also show hydrogenetic processes.

To understand the formation mechanisms of OH deposits collected in different hydrothermal fields located at the Mid-Atlantic Ridge near the Azores, mineralogical (microscopy and X-Ray Diffraction - XRD), geochemistry (major, trace and REE) and Scanning Electron Microscopy with Energy Dispersive Spectroscopy (SEM-EDS) data, was analyzed. Deposits include hydrothermal layered crusts, Fe-Si OH rich chimneys and OH accumulations in the surface of sulfide samples collected in different geological settings (on- and off-ridge and associated to Azores vulcanism).

All deposits are composed by amorphous to semi-amorphous OH phases with significant evidence of a low-temperature hydrothermal origin. However, they show different OH phases (in XRD spectra) and micro-textures (in high-resolution imaging, SEM-EDS), distinct Mn/Fe, Si/Fe, Fe/REE and trace metals (e.g., P, V, Cr, Co, Cu, Ni, As, Mo) compositions and chondrite-normalized REE patterns. Deposits from chimneys also show clear microbial activity.

The differences observed are discussed in terms of formation mechanisms, including the evolution of hydrothermal fluids and the contribution of seawater scavenging and biomineralization processes.

References:

[1] Hein, Koschinsky, Halbach, Manheim, Bau, Kang & Lubick (1997), *Geological Society Special Publications 119*(1), 123–138.

[2] Dekov, Kamenov, Savelli, Stummeyer, Thiry, Shanks, Willingham, Boycheva, Rochette, Kuzmann, Fortin & Vértes (2009), *Chem. Geol. 264*(1–4), 347–363.

[3] Iizasa, Kawasaki, Maeda, Matsumoto, Saito & Hirai (1998), *Marine Geology 145*(1–2), 1–21.

[4] Popoola, Han, Wang, Qiu & Ye (2019), *Minerals 9*(1), 19.

[5] Costa & Dias (2020), *Goldschmidt Abstracts,* 478.

[6] Dias, Costa, Marques, Ribeiro, Madureira, Calado, Gonçalves & Morato (2019), *Goldschmidt Abstracts*, 795.