Geochemistry of REE and trace elements in shallow hydrothermal vent system at Panarea island (Italy)

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The Rare Earth Elements (REE; lanthanides and yttrium) are important tracers of natural and anthopic geochemical processes. Here, recent progresses concenring the study of REE geochemistry in natural system are presented.

Specifically, the REE behaviour was investigated in SHV (shallow sea-water hydrothermal vents) in the sourranding area of Panarea Island (Eolian Island, Italy) [1]. The important role of pH (4.1 – 8.2) and Eh (-235 – 186 mV) conditions are responsible of the chemical composition and fractionation of REE, having a wide range of concentration values, spanning from 0.9 to 214.9 nmol l^{-1}. ΣREE (total REE concentration) is higher than REE reference seawater value [2] up to three order of magnitude and are inversely correlated relative to pH values.

Here, the pH and Eh conditions play a key role on water composition in terms of trace elements, controling the precipitation of S- and Al- bearing minerals inducing changes in REE fractionation [3]. As a result, REE Patterns normalized to PAAS show different trends respect the reference seawater trend: in particular Light REE (LREE) depletions are observed (Pr_N/Dy_n and Pr_N/Yb_N <1.0) respect MREE (Middle REE) and HREE (Heavy REE). The amplitude of LREE decrement is controlled by Al- bearing minerals as demostrated by inverse correlation between Ce_N/Lu_N and Al concentrations, showing and hyperbolic array.

Minor Ce anomaly (>0.6) have been calculated respect the well documented Ce anomaly in seawater (0.2) [4]. Probably the redox condition (Eh <0 mV) do not allow the oxidation of Ce(III) to Ce(IV), as a result the preferential scavenging over REE(III)s is inhibited.

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