

## **REE and HFSE mobility in the formation of calcsilicates: Bangemall Supergroup, Western Australia**

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There are numerous studies of diagenetic carbonate transformations of sedimentary successions, but there few systematic studies of REE and HFSE mobility in carbonate-rich units affected by post-depositional fluid and/or metamorphic events. Here we investigate the formation of calcsilicates and whether metasomatism that converted primary carbonates to calcsilicates imposed distinct REE and HFSE signatures relative to their siliciclastic and igneous adjacent units.

The Mesoproterozoic Bangemall Supergroup in the Edmund Basin, Western Australia, consists of fine-grained siliciclastic and carbonate sequences. Dolerites and subordinate gabbros, were intruded as sills and dykes into the Mesoproterozoic siliciclastic-carbonate sedimentary sequence. Dolerite sill -sedimentary rock contacts in the Ullawarra area display structures indicative of devolatilization of magmatic fluids along sill contacts. Calcsilicate contact metamorphic minerals have resulted from metasomatism by Ca-rich fluids under oxidizing conditions. High CO<sub>2</sub> magmatic and/or meteoric fluids have dissolved limestone units, enriching the fluid in Ca, inducing metasomatism to form calcsilicates due to sill-emplacement. From the available data, peak P-T conditions were ~7 kbars and ~600° C, resulting in kyanite formation which retrogressed to sillimanite. After the dolerite-siliciclastic-limestone interaction due to sill emplacement, and calcsilicate formation as a consequence of the metasomatic reaction with carbonate, the calcsilicates mimic the Zr/Hf, Nb/Ta, Th/U, Y/Ho and LREE/HREE ratio values of the adjacent siliciclastic- units. Dolerites preserved the Zr/Hf, Nb/Ta ratios, and Th concentrations, clustering close to MORB and UCC average values, and therefore, Zr, Hf, Nb, Ta and Th behaved as immobile elements, whereas U, LREE and Ho are mobile and were removed from the system.

Comparable siliciclastic-carbonate environments (fluids, salinity, complex ligands) at low temperature display significantly different REE and HFSE fractionation behaviour.