# Experimental determination of $C_l/C_o$ of Rb, Sr and Ba and comparison with $C_l/C_o$ of a migmatite

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## Introduction

As a way to settle the difficulties regarding the origin and evolution of granitic rocks, we studied the $C_l/C_o$ values of Rb, Sr and Ba from melts of the Ollo de Sapo Gneiss (modal comp.: Qtz: 42; Pl ($An_{19}$): 20; Kfs: 8; Bt ($Mg_{40}$): 10; Ms: 20) at 6 and 10 kbar, 750, 800, 850 and 900 ºC, and 10% wt water. Experiments were run in a piston-cylinder apparatus at the High Pressure Laboratory of the University of Huelva, and analysis were made using an ICP-MS of the Central Services of the University of Huelva.

A diamond trap has been used to separate melt from residual minerals, so a pressure gradient between powder and trap (which can be a source of disequilibrium) exists, but disappears or is minimised if melt soaks the trap and residual minerals. Thus, melting process begins as a fractional melting followed by a batch melting if melt quantity exceeds a critical amount.

## Discussion

At 6 kbar, $C_l/C_o$ values for Rb are lower than 1 (0,67-0,98) with a minimum at 800 ºC due to the high productivity of melt by the breakdown of feldspars; for Sr, $C_l/C_o$ is upper than 1 (1,01-1,43) and tends to this value with increasing melting amount; for Ba, $C_l/C_o$ is upper than 1 (1,01-1,24), with a maximum at 800 ºC. Comparing these values with calculated for High Himalayan leucogranites, assuming a greywacke source in presence of water, a clear resemblance for Rb and a difference for Sr and Ba can be seen.

## Conclusion

The election of the $K_D$ values has a decisive influence in $C_l/C_o$ values, although this discrepancy can also be due to a disequilibrium melting because of the diamond trap.

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# Radium isotopes as tracers of submarine groundwater and nitrogen discharge in a karstic area

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## Introduction

A mass balance for $^{223}$Ra ($T_{1/2}$=11.4 d) and $^{224}$Ra ($T_{1/2}$=3.66 d) is applied to a karstic area (*Badum*, Spain) to evaluate the submarine groundwater discharge (SGD) through coastal springs. The strategy is based on the enrichment of Ra in groundwater compared to surficial waters.

Ra isotopes were measured from coastal, brackish springs and seawater samples by using a *Radium Delayed Coincidence Counter* (Moore and Arnold, 1996).

## Results and discussion

All coastal samples are enriched in radium activities compared to the open sea, the highest activities being found in the springs. $^{223}$Ra and $^{224}$Ra concentrations are highly correlated and Ra vs. salinity plots suggest a mixing process between the springs and the coastal sea endmembers (Fig. 1). A Ra mass balance allows obtaining a groundwater fraction of 38%. By considering this fraction, the water residence time (0.5 d) also derived from the short-lived Ra isotopes and the sampled water column, a SGD flux is calculated to be $5{\cdot}10^6$ $m^3$ $yr^{-1}$. This flow accounts for a nitrate input of 3 mmol $m^{-2}$ $d^{-1}$, which is comparable with literature values of SGD-derived nitrogen inputs to coastal areas (Charette and Buesseler, 2004).

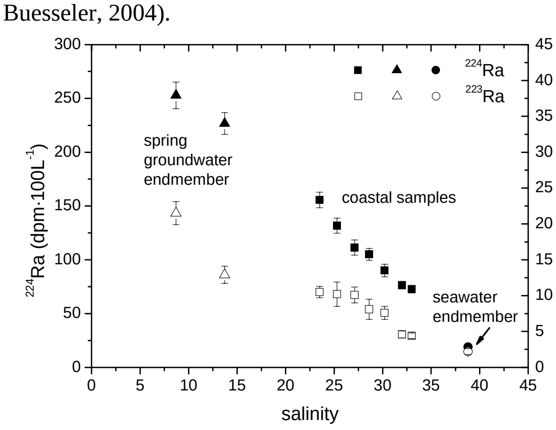


**Figure 1.** $^{223}$Ra and $^{224}$Ra activities in all water samples indicate the two endmembers.

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