Preliminary studies on Sr/Ca and Mg/Ca ratios in aragonitic marine bivalve shells by ICP-OES, ICP-MS and LA-ICP-MS

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The trace element composition of marine biogenic carbonates is gaining increased attention as a proxy for past climates and environments. We have employed ICP-OES, ICP-MS, and LA-ICP-MS to determine the trace element ratios of the shells of *Arctica islandica*. We evaluated the applicability of these three instruments and explored the characteristics of Mg:Ca and Sr:Ca ratios.

The sample material was life-collected from different localities around Iceland. Each shell was sampled in youth, mature and gerontic life stages (umbo, middle part, tip). The results are as follows: 1) Sr:Ca ratios: ICP-OES data are similar to the ICP-MS results; LA-ICP-MS data for middle portions are same as ICP-OES values; 2) Mg:Ca ratios: LA-ICP-MS results of umbonal and middle shell portions are lower than corresponding ICP-OES results, but the data from tip parts are slightly higher; And ICP-OES results are higher than corresponding the ICP-MS results, this findings coincides with previous findings by Andreasen *et al* (2006);

For a better interpretation of the results, we used EMPA to analyze the spatial distribution of Sr and Mg in cross-sections of the specimens. According to these element distribution maps, Mg is less homogeneously than Sr. In many portions of the annual increment, the Mg concentration is very low and Sr high. These data suggest that Mg and Sr ions behave totally different in aragonitic shells than in calcitic skeletons. The Mg content may be related to the organic matrix, while Sr may be more related to the carbonate matrix. This may be the reason for the difference in the three analyses.

Reference

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He and Ar isotopic composition of pyrite and its significance in XZ uranium ore-field, South China

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XZ uranium ore-field was one of the most important granite-type uranium deposits in China. Many argues such as mefeoric, magma ann mantle derived fluid on the original of the ore-forming fluid. Isotopic composition of He and Ar in pyrite, one of the most important paragenetic minerals with pitchblende in XZ uranium ore-field been applied to reveal the original of the ore-forming fluid in this paper. Pyrite paragenetic with pitchblende was sampled from the mine galley. He and Ar isotope was analyzed by the MI-1201IG inert gases mass spectrograph. Calculated results shown in table 1 and the results discussed below:

Table 1. He and Ar isotope composition of Pyrite

No	$^3He/^4He$ ($\times10^{-7}$)	^4He($\times10^{-6}$)cm^3STP/g	$^4He^*$($\times10^{-6}$) m^3STP/g	Rc/Ra
1	10.66±0.80	10.15	0.22	0.79
2	2.08±0.17	62.65	0.22	0.15
3	0.76±0.15	62.87	0.22	0.055
4	1.36±0.30	59.15	0.22	0.098

NB：Ra=1.39×10^{-6} ; radiogenic origin $^4He^*$ correct formula $^4He^* = 0.2355\times10^{-6}\times U^* cm^3/Mag_{H2O}$, $U^* = U[1+0.123(Th/U) - 4]$, suppose $U=150\times10^{-6}$

$^3He/^4He$ value varied in 0.79~0.06Ra, higher than 0.01~0.05Ra, the crust $^3He/^4He$ value, but lower than 6~7Ra, the continental mantle $^3He/^4He$ value[1].All samples distributed between the crust original and the mantle original range in $^3He/^4He$ diagram, which suggests that it had the crust and mantled mixed original of the ore-forming fluid. $^{40}Ar/^{36}Ar$ value varied between 282~319, all samples distributed between the crust original and the mantle original range in Rc/Ra vs.$^{40}Ar/^4He$ diagram, which also suggest the characteristic of mixed Ar original. The isotopic composition of He and Ar in pyrite might suggest that ore-forming fluid of XZ uranium ore-field might be the mixed product of crust and mantle fluid.

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References

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