European Mineralogical Conference
Vol. 1, EMC2012-476, 2012
European Mineralogical Conference 2012

$^{87}Sr/^{86}Sr$ isotope ratios in single benthic foraminifera and ostracods by LA-MC-ICPMS

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$^{87}Sr/^{86}Sr$ analysis of foraminifera is usually performed from solution samples using either TIMS or MC-ICPMS techniques. With increasing precision offered by recent advances of laser ablation instrumentation, the LA-MC-ICPMS approach rivals solution work in terms of precision, and outperforms conventional solution techniques in terms of sample throughput and time needed per analysis.

Within an ongoing paleoclimatic study, we have determined $^{87}Sr/^{86}Sr$ isotope ratios from single tests of the benthic foraminifera *Quinqueloculina* sp. and single valves of the ostracod *Cyprideis* sp. from a Neogene (Upper Serravallian to Lower Tortonian) hyperhaline paralic sequence in Central Anatolia, Turkey. The analytical setup used consists of a RESOlution M-50 excimer LA instrument (λ=193 nm) including a factory-built Laurin two-volume sample cell, coupled to a Thermo Neptune MC-ICPMS. During 60 seconds of data acquisition a 200-300 μm long line was ablated (8 Hz, 3.5 J/cm^2) with pit diameter varying between 53 to 140 μm. After correction for interferences from Rb, Kr, Ca-dimers and doubly-charged REE, all Sr isotope data were corrected for mass fractionation ($^{86}Sr/^{88}Sr$ = 0.1194) and normalized to NIST SRM987 using $^{87}Sr/^{86}Sr$ of 0.71025. Repeated measurements on a recent coral from the Red Sea ($\sim$3000 ppm Sr) yielded $^{87}Sr/^{86}Sr$ ratios of 0.709235 $\pm$ 0.000023 (2σ s.d.).

For the *Quinqueloculina* sp. tests and *Cyprideis* sp. valves, pit diameter were adjusted to 80-120 and 53 μm, respectively, and and the ablation path was located at the topmost part of the curved, quasi-globular surface. $^{87}Sr/^{86}Sr$ ratios cover a range from 0.707129 $\pm$ 0.000037 to 0.707902 $\pm$ 0.000021, with calculated net reproducibilities being in the range of as low as $\pm$0.000040 (2σ s.d.).

The $^{87}Sr/^{86}Sr$ values are significantly lower than the range of global values for the Miocene. We conclude that salinity budget in the basin was strongly influenced by subsurface leaching of Permian evaporite bodies (and/or their dissolved and re-precipitated "equivalents" in the Oligocene) in a dominantly extensional tectonic regime under relatively humid climatic conditions, that together gave rise to enhanced groundwater flow and high salinity in the closed Neogene continental basins of Central Anatolia.

Overall, the LA-based analysis of $^{87}Sr/^{86}Sr$ in foraminifera and ostracods is likely most suitable in cases where low sample amounts (e.g. high-resolution stratigraphic work on drillcores) and/or high sample numbers are dealt with; i.e. for material otherwise not providing the necessary Sr concentration in the final solution, or requiring time-consuming Sr separation and solution work. Also, potential isotopic bias by sedimentary reworking can be readily identified by the "single-shell" approach; an effect that remains masked with the solution-based "multi-shell" procedure.