Nitrogen and noble gases in caliche from the martian meteorite SaU 008.

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Introduction

Influence of an elementally fractionated air (EFA) component to the low temperature noble gas signatures has been inferred for martian meteorites collected from hot deserts (Mohapatra et al. 2002). We present here stepped pyrolysis (Mohapatra et al. 2001) data for a caliche (a weathering product) sample from SaU 008, a martian meteorite collected in Oman.

Results

Isotopic compositions of nitrogen (_^{15}N) and of noble gases (^{40}Ar/^{36}Ar and ^{129}Xe/^{132}Xe) in the 250 and 400 °C extractions suggest significant contributions from terrestrial atmosphere (Fig. 1). The accompanying elemental ratios – ^{36}Ar/^{14}N (6 to 27×10^{-7}), ^{84}Kr/^{132}Xe (5 to 22) reveal the elementally fractionated nature of this component. Much lighter _^{15}N and higher ^{40}Ar/^{36}Ar (~675) show (partially at least) the alien nature of the gas released at 1000 °C. Nevertheless, ^{129}Xe/^{132}Xe is air-like, and the ^{36}Ar/^{14}N ~2×10^{-7}, ^{84}Kr/^{132}Xe ~11 elemental ratios display a similar "fractionation" pattern.

Although we have inferred a ^{84}Kr/^{132}Xe of 2, expected for adsorption from air, for EFA in SaU 005, data from the present caliche are higher, and show variable contributions from components similar to solution (S ~14) and terrestrial atmosphere (~28).

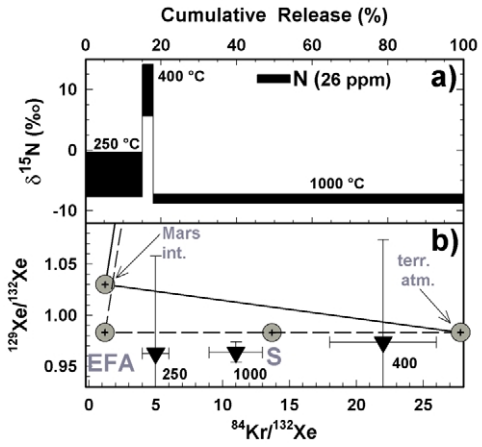

Figure 1: a) Cumulative release of nitrogen by stepped pyrolysis in SaU 008, caliche. **b)** Plot between ^{129}Xe/^{132}Xe and ^{84}Kr/^{132}Xe, Mars int. (Ott 1988), S= solution and terr. atm. from Ozima and Podosek (1983).

References

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Flexible Multiple Ion Counting Detectors for TIMS and ICP Multicollector Mass Spectrometers

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Precise isotope ratio measurements on smaller and smaller sample sizes mean a challenge for instrumental development of multicollector mass spectrometers. Sensitivity has been steadily improved, analytical blanks have been minimized and high mass resolution is available to eliminate molecular interferences, however, very little progress has been made on the noise reduction at the detector side. The clear answer to this problem is Multiple Ion Counting (MIC).

In case of uranium and lead measurements, the spacing between adjacent masses in the multicollector array is typically in the order of 2-3 mm, which is far too small for the space requirements of a classical ion counter. In order to circumvent this problem, we developed special miniaturized "plug-in" ion counters identical in size with the Faraday Cups used in the **Thermo**Finnigan *TRITON* (TIMS) and *NEPTUNE* (ICPMS) multi-collector platform. These miniaturized ion counters can directly replace any of the 8 motor-controlled Faraday Cup detectors, or they can be mounted as a package of several ion counters and hung on the side of a variable Faraday Cup. Up to eight ion counters and 10 Faraday Cups can be used simultaneously all across the detector array. The collector array of the "plug-in" detectors can be re-configured any time by the user if needed.

For instance, this setup allows measurement of all Pb-isotopes (204-206-207-208) and ^{232}Th and ^{238}U simultaneously during laser ablation ICPMS analysis of zircons. Ion counters for ^{203}Tl and ^{205}Tl can be added for control of mass bias.

Performance of the multiple ion counters with respect to stability, linearity, the attainable precision and the flexibility of detector configurations will be documented by the analysis of standard reference materials on the *TRITON* (TIMS) instrument.