NOBLE GASES IN COSMIC SPHERULES AND MICROMETEORITES FROM THE TRANSANTARCTIC MOUNTAINS.

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Introduction: At MPI Mainz we have initiated a comprehensive survey of noble gases in micrometeorites. While He and Ne in micrometeorites are generally dominated by solar contributions, the inventory of heavy primordial noble gases is not as well characterized. We hope to fill this gap with particular focus on the diagnostic isotopic composition of Xe. While our study will eventually include material from a variety of collections (e.g. the CONCORDIA collection [1]), our first results are from “large” PNRA (Programma Nazionale delle Ricerche in Antartide, Italy) micrometeorites collected from the Victoria Land, Transantarctic Mountain micrometeorite traps [2].

Samples and Analytics: 51 micrometeorites (MM´s) - 26 cosmic spherules (CS), 11 scoriaceous (Sc), 14 unmelted (Un) - in the 600-800 µm size range were extracted from traps #45 b and c on the top of Miller Butte, and split into aliquots for combined petrographic and noble gas analyses. For the latter, aliquots were heated using a CO_2 laser. The analyses were performed using our multicollector Nu Instruments noble gas mass spectrometer [3].

Preliminary Results: At present, we have obtained noble gas results for three CS and one Sc micrometeorites. Our Ne and Ar results (corrected for isobaric interferences, but not extraction blank) are listed in Table 1.

Table 1. Ne and Ar results for MM´s. Sizes are given in µm. Weights are given in µg, noble gas amounts - not corrected for blank - in 10^{-12} cc units. Uncertainties in the last digits.

Sample	Size	Weight	^{22}Ne	^{20}Ne/^{22}Ne	^{21}Ne/^{22}Ne	^{36}Ar	^{40}Ar/^{36}Ar
CS 45c21	720 x 556	337.9	0.41	9.11 (37)	0.029 (2)	0.40	319 (17)
CS 45c17	630 x 476	126.3	0.16	9.34 (1.01)	0.038 (6)	2.36	280 (9)
CS 45c16	465 x 324	105.1	0.21	8.85 (85)	0.027 (4)	0.98	292 (10)
Sc 45b22	268 x 191	9.2	0.49	10.46 (45)	0.062 (4)	1.04	128 (5)

As found in previous studies (e.g. [4, 5]) noble gas abundances in CS are mostly low and essentially have a terrestrial air signature (e.g. ^{20}Ne/^{22}Ne ~9.8, ^{21}Ne/^{22}Ne ~0.029). In contrast, the Sc micrometeorite shows ^{20}Ne/^{22}Ne and (even clearer) ^{21}Ne/^{22}Ne ratios higher than air, indicative of the presence of solar and spallogenic Ne. Using the production rates for IDPs from table 3 in [6], the spallogenic ^{21}Ne of ~1.6 x 10^{-9} cc/g would be produced at 1 AU by SCR primaries in ~0.17 Ma, for production by GCR primaries, the inferred exposure would be ~ 4 Ma. The concentration of trapped (solar) ^{20}Ne of ~5 x 10^{-7} cc/g is about an order of magnitude lower than the geometric mean for Un micrometeorites from Yamato Mountains and Dome Fuji, but distinctly higher than in CS (see table 4 in [4]). The low ^{40}Ar/^{36}Ar ratio for the Sc micrometeorite (~128) indicates the presence of trapped ^{36}Ar, at an abundance of ~6 x 10^{-8} cc/g. This is most likely “planetary” type Ar, carried primarily by phase Q [7].

Acknowledgments: We acknowledge support by DFG through SPP 1385 (Project OT 171/5-1) and PNRA.

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