

NITROGEN AND ARGON COMPONENTS IN CAPE YORK. S. V. S. Murty and K. Marti, Chemistry Dept., Univ. of Calif., San Diego, La Jolla, Calif. 92093.

Nitrogen in meteorites exhibits a large range in isotopic composition. The isotopic composition of nitrogen has been diagnostic in understanding the stellar source of the presolar material in carbonaceous chondrites (1). A simultaneous study of nitrogen and noble gases can yield better information regarding the anomalies. With this objective in mind, we have developed a procedure similar to that reported (2) to measure nitrogen and noble gases by static mass spectrometry. The light nitrogen, in most of the iron meteorites (3), has made them interesting objects for a systematic study of their nitrogen composition. Stepped pyrolysis is employed to extract the gases. Here we report the N_2 and Ar in a metal piece of Cape York and in a tiny metal bleb in a troilite nodule of Cape York. The troilite separate is under investigation. Nitrogen: The $\delta^{15}N_{air}$ of Cape York metal chip agrees with the reported value (3), but the nitrogen content is lower than literature values (3,4). Apparently there is incomplete recovery of released nitrogen, without isotopic fractionation. Also, there is no isotopic memory, as the blank N_2 at the end of metal chip gives normal isotopic composition. The process of N_2 loss is under investigation. Hence, relative yields for a given sample and the isotopic composition are given. The metal bleb has nitrogen of nearly atmospheric composition, while the metal chip contains lighter nitrogen. Both reveal one major component of nitrogen, as shown in Fig. 1.

Argon: ^{36}Ar is 14 times larger in the metal bleb, as compared to metal chip. Three isotope plots are shown in Fig. 2. Both samples show a two component mixture. One of the components for both is of air composition (or air contamination). The second component is the normal spallogenic Ar expected in iron meteorites, for the metal chip, but it is of considerably different composition ($^{38}/^{36} = 0.32$) for the metal bleb. The 1700°C point is off the mixing line for the metal chip. It may be due to some contribution from the other cosmogenic component of argon ($^{38}/^{36} = 0.32$) to the 1700°C fraction. Cosmic ray produced ^{38}Ar for the two samples, as calculated from the data, differ by a factor of 3 (metal chip = 0.45×10^{-9} cc STP/g, metal bleb = 1.22×10^{-9} cc STP/g) even though both pieces are only ~ 3 cms apart. The isotopic signature of Ar, in metal bleb, reflects the importance of neutron capture reactions on chlorine, which predominantly produce ^{36}Ar . Observed excesses of ^{80}Kr and ^{82}Kr support this interpretation. Some contribution by recoil from chlorine in troilite is possible, but, since ^{36}Ar is released at high temperature, it appears that the metal bleb has partially equilibrated with the troilite (or contaminated with troilite) and the N_2 and Ar may be similar to those of troilite. Nitrogen of atmospheric composition in Cape York troilite is not unlikely, along with the air-like xenon (5). Excess ^{80}Kr , ^{82}Kr and ^{128}Xe from Br and I are reported for Cape York troilite (5).

References:

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Sample	Temp. (°C)	N ₂ *	$\delta^{15}\text{N}_{\text{air}}$	^{36}Ar ccSTP/g ($\times 10^9$)	$^{40}\text{Ar}/^{36}\text{Ar}$	$^{38}\text{Ar}/^{36}\text{Ar}$
<u>Metal bleb in Troilite</u>	400	< .0001	0	< 0.01	—	—
	1000	.8342	- 5.46 + 2.69	1.88	89.64 ± 10.64	.2653 ± .0121
	1700	.1657	- 5.89 9.31	27.31	215.88 4.60	.2273 .0082
	Total	1.0000	- 5.53 3.78	29.19	207.74 4.99	.2297 .0084
<u>Metal Chip</u>	400	< .0001	0	< 0.001	—	—
	800	.0007	- 6.11 5.20	0.009	169.66 8.39	.6771 .0753
	1000	.0123	- 77.58 2.36	0.023	42.55 3.65	1.5135 .0250
	1200	.9581	- 81.49 2.04	0.044	82.12 4.26	1.2152 .0675
	1500	.0159	- 48.61 5.43	1.816	258.56 5.11	.3360 .0298
	1700	.0130	- 24.42 1.18	0.155	129.40 2.38	.8175 .0162
	Total	1.0000	- 80.19 2.04	2.048	242.07 4.89	.4065 .0297

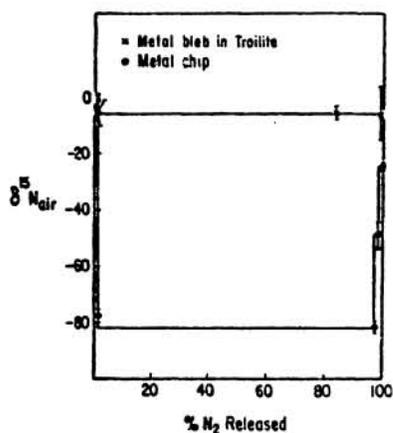
* N₂ is expressed in units relative to the total.

Fig. 1

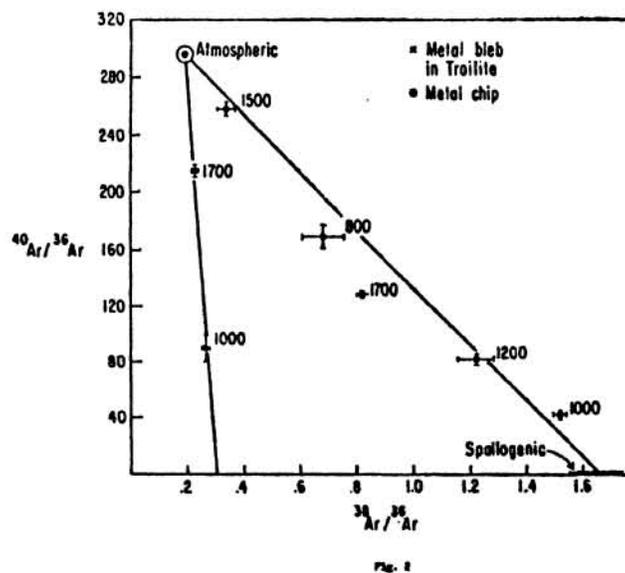


Fig. 2