NITROGEN ISOTOPIC COMPOSITION IN MUONG NONG TEKTITES. S.V.S. Murty, Physical Research Laboratory, Ahmedabad 380 009, INDIA.

Nitrogen and noble gases have been analyzed in 2 samples of Muong Nong tektites. The N contents are 0.5 and 1.34 ppm with $\delta^{15}N$(‰) of 8 and 17 respectively. Except for radiogenic ^{40}Ar, all noble gas isotopic ratios are atmospheric. Elemental ratios show clear enrichment of He and Ne while the heavier noble gases are normal. Higher than air like $N/^{36}Ar$ values, together with the positive $\delta^{15}N$ clearly show that most of the N in Muong Nong tektites is from the source material and of sedimentary origin.

Introduction: Tektites are natural silica-rich glasses, with most of them having regular and aerodynamically sculptured shapes though some bulky irregular tektites called Muong Nong type also exist. It has been well established that tektites are of terrestrial impact origin, but in water and volatile contents, they are more depleted than impact glasses [1]. The exact mechanism of tektite formation and their geographic distribution are still not well understood. Recent noble gas studies in tektites have shown that they are isotopically similar to air, but elementally show an enrichment of Ne [2–5]. The low amounts of heavy noble gasses have been interpreted as due to their solidification at low ambient pressure, while Ne enrichment is due to later inward diffusion [2]. The study of nitrogen (the most abundant atmospheric species) in tektites will thus be very important. Earlier studies have only concentrated on N abundance [6,7] and no isotopic data exists for N in tektites. Here we report the simultaneous study of N and noble gases in two Muong Nong tektites.

Samples: Samples from two different Muong Nong tektites have been studied for nitrogen and noble gases by stepwise temperature pyrolysis. Both the samples are prepared by silicing and cutting the original tektite with diamond wheel under water cooling. Sample 1 has about 20% of the exterior surface of the original tektite while sample 2 is completely from interior. Both the samples showed bubbles and voids under transmission microscope. Sample 2 is from layer 5 of slice 2 that has been studied earlier, wherein layers 2,4 and 6 from slice 2 have been analyzed for N and trace elements [6].

Results: The N and noble gas data of the totals are presented in table 1 for both the samples of M.N. Tektites. Except for the ratio $^{40}Ar/^{36}Ar$, wherein some radiogenic ^{40}Ar is clearly visible all other noble gas isotopic ratios are atmospheric within experimental errors. The N contents are 0.505 and 1.34 ppm with positive $\delta^{15}N$.

The noble gas amounts in M.N. tektites are higher than in splash form tektites [3,4], but towards the lower end of the range for the impact glasses [4,5]. The N contents of the present samples are much lower than the typical N content of 15 ppm for normal tektites [6], though a value of 0.5 ppm. N has also been found for one M.N. tektite sample in the earlier study [7]. The most interesting finding of the present study is the positive $\delta^{15}N$, which clearly shows that N is of non-atmospheric origin.

The noble gas elemental ratios clearly indicate enrichments in the light noble gases He and Ne with respect to air composition, while the heavy noble gases are in air proportions within errors. This observation is similar to what has been found in other tektites [2–5], except that we find ^{4}He enrichment also in the present study. The excess ^{4}He can not be explained as insitu radiogenic component, given the average U and Th contents of 2.5 ppm and 11 ppm for M.N. tektites [1]. An inward diffusion of He, from ambient atmosphere, during geological time, similar to the case of Ne is the most likely source for its enrichment.

Higher $N/^{36}Ar$ values than air for both the samples, clearly show that about 50% of N in sample 1 and >90% N in sample 2, are of non-atmospheric origin. The source of this extra N has to be the source rock of the tektites. The positive $\delta^{15}N$ is clearly consistent with N signatures from sedimentary rocks [9]. For K=2% [1] the excess ^{40}Ar gives a K-Ar age of 4 Ma, much above the fission track ages of 0.7 Ma [8], indicating that most of ^{40}Ar excess is from the source rock, due to incomplete degassing during the tektite formation process. Under such formation conditions, it would not be surprising to retain a fraction of the N from the source material, with its non-atmospheric $\delta^{15}N$ value. It will be very interesting to study the N composition in normal tektites.

Table 1. N and noble gas data for M.N. tektites

	^{4}He	^{20}Ne	^{36}Ar	^{84}Kr	^{132}Xe	N	δ^{15}N	^{40}Ar/
	10^{-8}cc STP/g			10^{-12}cc STP/g		(ppm)	(‰)	^{36}Ar
Sample-1	214.2	17.8	0.875	142.6	6.56	0.505	7.85	335.8
(386.94 mg)							±1.16	2.7
	245	20.3	=1	1.63×10^{-2}	7.5×10^{-4}	4.62×10^{4}		
Sample-2	15.6	3.0	0.265	41.8	2.02	1.34	16.80	360.4
(761.57 mg)							.59	2.0
	59	11.3	=1	1.57×10^{-2}	7.62×10^{-4}	4.0×10^{5}		

Uncertainties in isotopic composition represent 95% C.L.
Uncertainties in concentrations are ±10% (He, Ne, Ar and N) and ±15% (Kr, Xe)

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