^{22}NE-E(L) MEASURED IN INDIVIDUAL KFC1 GRAPHITE GRAINS FROM THE MURCHISON METEORITE K. Kehm[1], S. Amari[1], C. M. Hohenberg[1], and R. S. Lewis[2]; [1]McDonnell Center for the Space Sciences and Physics Department, Washington University, St. Louis, MO 63130 USA; [2]Enrico Fermi Institute, University of Chicago, Chicago, IL 60637 USA.

We have analyzed 46 individual graphite grains from Murchison KFC1 (2.15-2.20 g/cm^3) first by ion microprobe to determine C and N isotopic compositions and then by laser gas-extraction to determine He and Ne compositions. This work is part of our ongoing investigation of noble gas compositions in individual SiC and graphite grains from the Murchison meteorite [1, 2, 3]. Each of the measured grains was inferred to be circumstellar (CS), based on isotopic anomalies in at least one element. Three of the 46 grains contained ^{22}Ne-E(L) in measurable quantities (listed below):

KFC1 gas-rich grains	diameter	excess ^{22}Ne (cc/g)	^{20}Ne/^{22}Ne	^{12}C/^{13}C	^{14}N/^{15}N
257	4.5 μm	$8.1 \pm 2.4 \times 10^{-4}$	$< 1.29 \pm 0.41$	396 ± 5	267 ± 7
352	3.7 μm	$7.5 \pm 0.8 \times 10^{-3}$	$< 0.03 \pm 0.03$	10 ± 1	258 ± 8
534	4.3 μm	$5.1 \pm 1.4 \times 10^{-4}$	$< 2.41 \pm 0.77$	873 ± 15	274 ± 11

No significant ^{4}He or ^{20}Ne was detected above blank in any of the grains, consistent with previous measurements of CS graphite [1,2,3]. However, by subtracting the 'blank' analysis containing the smallest amount of ^{20}Ne from these data, upper limits on the ^{20}Ne/^{22}Ne ratios were calculated (see above). The C and N isotopic ratios for the data set, which are typical of KFC1 graphite, are plotted in Fig 1. The 3 gas-rich grains, plotted as open circles, span a wide range of C isotopic values.

The implied Ne-E(L) concentration in KFC1 derived from these 3 gas-rich grains is ~9 × 10^{-5} cc/g, which is in agreement with bulk measurements of the KFC1 residue [4]. This result suggests that, as is the case for Murchison SiC and both KE3 (1.60-2.05 g/cc) and KFB1 (2.10-2.15 g/cc) graphite, a small ^{22}Ne-rich fraction of the grains can account for all of the Ne-E measured in the corresponding bulk residues. However, unlike KE3 and KFB1 where about ~30% of the grains are gas-rich, only about 7% of KFC1 grains contains detectable ^{22}Ne. According to bulk measurements [4], Ne-E(L) is ~40% less abundant in KFC1 than in KFB1. This result is consistent with our observation that grains with measurable ^{22}Ne are less abundant in KFC1, and may imply that variations in Ne-E concentrations between CS graphite residues of

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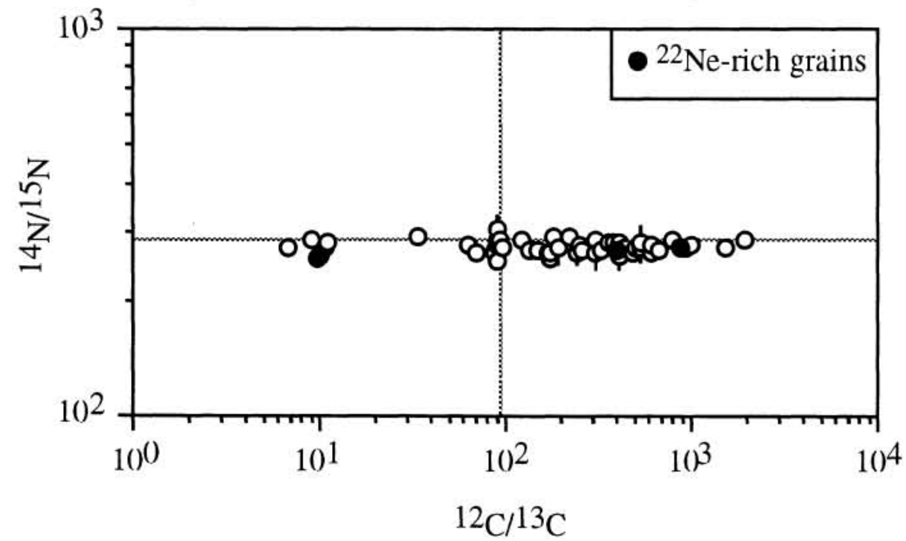
different densities are due to different abundances of gas-rich grains, rather than a lower average ^{22}Ne concentration in the gas-rich fraction.

Several stellar sources have been suggested for KFC1 graphite, including low-metallicity AGB stars to explain observations of a unique Kr-S component [4], He-burning in massive stars to explain the preponderance of large $^{12}C/^{13}C$ ratios [5], and novae to account for very low $^{20}Ne/^{22}Ne$ ratios [4,6]. A relatively high ^{22}Ne concentration, coupled with a low $^{12}C/^{13}C$ ratio in grain 352 (above), is indicative of a nova where ^{22}Ne enrichments occur via the *in situ* decay of nova-produced ^{22}Na (2.6a). In these aspects, grain 352 and KFB1 grain 161 [1,2] are quite similar, suggesting that novae contributions to Murchison graphite may be common to different density fractions. He-burning in Wolf-Rayet and pre-type II supernova stars has been suggested as a source for both high $^{12}C/^{13}C$ and low $^{20}Ne/^{22}Ne$ ratios such as that observed in grains 257 and 534 above [5]. In this scenario ^{14}N, which is abundant after the cessation of the CNO cycle, is converted into ^{22}Ne during He-burning [5]. With isotopic data from only three elements we are unable to put more stringent constraints on stellar sources for these grains. However, as previously noted [1,2,3,4], multiple sources for Ne-E in KFC1 are implied.

Fig. 1. C and N isotopic compositions for 46 KFC1 graphite grains. Shaded lines demark solar compositions.



References: [1] Nichols R. H. Jr. et al. (1992) LPSC XXIII, 989-990; [2] Nichols R. H. Jr. (1992) Ph.D. Thesis, Washington University, St. Louis, pp. 171; [3] Nichols R. H. Jr. et al. (1994) Meteoritics **29**, 510-511; [4] Amari S. et al. (1995) GCA 59, 1411-1426; [5] Amari S. et al. (1993) Nature **365**, 806-809; [6] Clayton D. D. (1975) Nature **257**, 36.