ISOTOPIC ANALYSIS OF PRESOLAR GRAPHITE FROM THE MURCHISON KFB1 SEPARATE.

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Introduction: Presolar graphite grains, the carrier of Ne-E(L), show a range of density (1.6 –2.2 g/cm^3) and their isotopic features depend on density [1-3]. Low-density graphite grains from the separate KE3 (1.65 – 1.72 g/cm^3) extracted from Murchison [4] are characterized by ^{18}O excesses, Si isotopic anomalies (mainly in the form of ^{28}Si excesses), high inferred ^{26}Al/^{27}Al ratios (up to 0.1), as well as the initial presence of ^{44}Ti ($T_{1/2}$ = 60 a) [5]. These features indicate that they formed in supernova ejecta. Of the other three graphite separates from Murchison, KFA1 (2.05 – 2.10 g/cm^3) and KFB1 (2.10 – 2.15 g/cm^3) also contain grains with ^{18}O excesses, although the fraction of grains with such excesses is smaller than in KE3 [6, 7].

Amari et al. [8] have reported on a search for the initial presence of ^{60}Fe in low-density graphite grains but could not confirm it. ^{22}Ne in low-density graphite grains appears to be due to the decay of ^{22}Na ($T_{1/2}$ = 2.6 a) synthesized in the O/Ne zone [9, 10]. One of the radioactive isotopes that are produced in this zone and are of interest with respect to the early solar system is ^{60}Fe ($T_{1/2}$ = 1.49 Ma). Here we report on our continuing effort in the search for ^{60}Fe in graphite grains.

Results and Discussion: We analyzed isotopic ratios of 15 grains from KFA1 with the NanoSIMS at Washington University. Ten grains have ^{12}C/^{13}C ratios between 74 and 90 (solar: 89). Only one grain has a ^{12}C/^{13}C ratio significantly higher (493) than the solar ratio. Two of the three ^{18}O-rich grains exhibit low ^{12}C/^{13}C ratios (7.7 and 13.9). One grain with a low ^{12}C/^{13}C ratio (14.5) but a normal ^{18}O/^{16}O ratio shows anomalous Ti with a V-shape isotopic pattern when normalized to ^{48}Ti and the solar ratios. The ^{50}Ti/^{48}Ti of the grain was not determined because of a huge ^{50}Cr correction. Grains that belong to this population, characterized by low ^{12}C/^{13}C ratios (~ 10), are enigmatic: many of them show normal isotopic ratios in trace elements and it is not easy to decipher the stellar sources of these grains. In this study, two such grains, with ^{18}O excesses, undoubtedly originated from supernovae. The grain with the Ti isotopic anomaly shows a signature of neutron capture. However, it is not clear whether it was produced in a supernova, an AGB star, or a yet unidentified stellar source. ^{57}Fe/^{56}Fe, ^{60}Ni/^{62}Ni and ^{61}Ni/^{62}Ni ratios of all 15 grains are normal within errors and we still have not obtained any evidence for the initial presence of ^{60}Fe.

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