INVESTIGATION OF PRESOLAR SILICATE GRAINS FROM ENSTATITE CHONDRITES

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Introduction: Since their discovery in IDPs [1], presolar silicate grains have been found in a number of primitive meteorites [2-4]. However, there is still little information available for presolar silicates from enstatite chondrites. Here, we report results from three EH3 chondrites: paired SAH 97159 and SAH 97096, and Qingzhen.

Experimental: We carried out NanoSIMS isotopic ($^{12, 13}$C and $^{16, 17, 18}$O) imaging on thin-sections of Sahara 97159 and Qingzhen and size-separated grains of SAH 97096. Total areas analyzed were 10800 μm^2 in SAH 97159, 5600 μm^2 in Qingzhen and 14400 μm^2 in SAH 97096. Auger Nanoprobe was then used for elemental analyses of the O-anomalous grains identified.

Results and Discussion: We identified eight O-anomalous grains each in SAH 97159 and SAH 97096, but none from Qingzhen. All eight grains in SAH 97159 and six of the eight grains in SAH 97096 are ^{17}O-rich and belong to group 1, with likely origins in low- to intermediate-mass red giant or AGB stars [5]. The remaining two grains in SAH 97096 are ^{18}O-rich and belong to group 4. One grain in SAH 97096 has a ^{17}O/^{16}O ratio of 134±1 ($\times 10^{-4}$) and can be considered an 'extreme group 1' grain [e.g., 3]. Auger spectra of the grains from SAH 97096 show that three are Fe-oxides and another three are ferromagnesian silicates. Two grains were sputtered away during the NanoSIMS measurement. The O-anomalous grains identified in the thin-section of SAH 97159 could not be measured due to sample charging issues. The abundance of O-anomalous grains in SAH 97159 is ~100 ppm, much higher than a previous estimate of <3 ppm for paired EH3 chondrite SAH 97072 [6].

We also found C-anomalous grains in these meteorites, 14 in SAH 97159, four in SAH 97096 and one in Qingzhen; all have ^{12}C/^{13}C ratios range from 18-80, similar to the compositions of mainstream SiC grains [7]. The estimated abundance of these grains in SAH 97159 is ~50 ppm, higher than the abundance estimated for SAH 97072 (~6 ppm [6]) and also somewhat higher than estimates for other enstatite chondrites based on noble gases [8]. The abundance for Qingzhen is ~9 ppm, which is similar to a previous estimate [8].

The SAH EH3 chondrites studied here have higher abundances of presolar grains (silicates, oxides and carbonaceous grains) than previous work [6] suggests, and provide the potential for detailed comparison with the presolar grain populations in carbonaceous chondrites. The lower abundances of presolar grains in Qingzhen suggest it experienced more thermal processing than the SAH enstatite chondrites.

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