Heterogeneous distribution of presolar SiC in the Tagish Lake meteorite

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Samples from Tagish Lake (C2-ung.) include well documented clasts with minimal terrestrial alteration that experienced different degrees of aqueous alteration on the parent body [1]. Increased aqueous alteration of these samples resulted in a correlated decrease of the H/C ratio and δD of insoluble organic matter (IOM) [1]. The motivation for this project was to characterize the effects of aqueous alteration on primordial noble gases and their carriers. Hence, we analyzed the isotopic and elemental compositions of all noble gases in IOM from the four samples (5b, 11h, 11i, 11v in [1]) using stepwise heating. Unexpectedly, the second most altered sample, 11i, had a concentration of essentially pure ^{22}Ne associated with presolar SiC and graphite (so-called Ne-E) that was 2-3 times higher than the respective gas concentrations in the other samples. As noble gases cannot always provide good estimates of presolar grain abundances [2], we also determined the abundances of SiC in the samples using NanoSIMS ion imaging [2]. For each of the four samples, areas of 5908-7865 μm^2 were imaged and 18-51 SiC grains identified. The matrix-normalized SiC abundances are within the range of typical abundances in other primitive meteorites [2]. The three samples (5b, 11h, 11v) that have relatively similar Ne-E concentrations also have similar SiC abundances based on ion images. The SiC abundance in 11i is about twice as high as in the other samples, similar to what was observed in the noble gases. Based on the agreement between the two independent ways of estimating SiC abundances, we conclude that the SiC distribution in Tagish Lake is heterogeneous with the highest abundance found in one of the more altered samples. If Tagish Lake initially had a homogenous presolar SiC distribution, aqueous alteration must have re-distributed the grains so that 11i became enriched compared to the other samples. The noble gas and C nucleosynthetic anomalies associated with the presolar grains in the samples will also be discussed.

[1] Herd *et al.* (2011) *Science* **332**, 1304-1307. [2] Davidson et al. (2014) *GCA* **139**, 248-266.