Q-GASES IN TWO TAGISH LAKE CLASTS WITH DIFFERENT DEGREES OF AQUEOUS ALTERATION, A CLOSED SYSTEM STEP ETCHING EXPERIMENT.

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Introduction: Tagish Lake is a unique primitive meteorite, classified as ungrouped C2 with affinities to both CM and CI chondrites [1]. It contains clasts that have undergone different degrees of aqueous alteration based on their petrology [2,3]. The insoluble organic matter (IOM) in these clasts have variable isotopic and elemental compositions, - H/C and δD decrease with increasing degree of aqueous alteration [2]. Most of the primordial noble gases in meteorites are present in IOM, carried by refractory presolar grains or phase Q. Phase Q is the host phase of most of the heavy primordial noble gases (Ar, Kr, Xe), but also contains some He and Ne. Here we use the IOM with the highest H/C and δD (i.e., least altered, sample "5b") and lowest ratios (i.e., most altered, sample "11v") analyzed in [2] to investigate if the Q gases are also affected by aqueous alteration. Noble gases were extracted by Closed System Step Etching (CSSE) with HNO_3 [4], using a similar protocol for the two etch run. All He-Xe isotopes were analyzed in a total of 19 etch steps in each sample.

Results and Discussion: The clearest differences between the two etch runs are seen in the Ne isotopic compositions and in the He/Ar and Ne/Ar ratios. Neon isotopic compositions vary significantly between the two etch runs. The more altered sample 11v contains considerable amounts of Ne-E (steps 3-19, 20-50% of ^{22}Ne), which is a presolar component known to be carried by graphite and SiC and is sometimes released together with Q in CSSE experiments [4,5]. In the least altered sample 5b, no significant contribution from Ne-E is visible until step 15 when the ^{20}Ne/^{22}Ne ratio drops below 9 (^{20}Ne/^{22}Ne$_Q$ = 10.1-10.7). The total concentration of ^{20}Ne is similar in the two etch runs, but the total concentration of Ne-E is about twice as high in the 11v etch run. One possible interpretation of this is that the aqueous alteration attacks the pre-solar graphite and facilitates gas release during etching. Another possible explanation is that presolar grains were heterogeneously distributed in the Tagish Lake parent body.

He/Ar and Ne/Ar ratios vary over the etch run, with the ratios being higher in the early steps, decreasing in the intermediate steps and later increasing again. Variations in the ratios suggest that perhaps Q is not one homogeneous component, but a mix of at least two sub-components with slightly different elemental compositions and different susceptibility to oxidation. The same pattern has previously been seen in other chondrites during similar experiments [4,5]. The total ratios are similar to those of CM chondrites.

References: [1] Brown P. G. et al. 2000. *Science* 290:320-325. [2] Herd C. D. K. et al. 2011. *Science* 332:1303-1307. [3] Blinova A. I. et al. 2014. *Meteoritics & Planetary Science* 49:473-502. [4] Busemann H. et al. 2000. *Meteoritics & Planetary Science* 35:949–973. [5] Wieler R. et al. 1992. *Geochimica et Cosmochimica Acta* 56:2907-2921.