**PARENT BODY MODIFICATION OF THE STRUCTURE, AND ELEMENTAL AND ISOTOPIC COMPOSITIONS OF IOM IN TAGISH LAKE**

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**Introduction:** The ungrouped C2 Tagish Lake has a mineralogy, O isotope, and bulk chemical composition that is intermediate between CI and CM chondrites [1]. The two major lithologies of Tagish Lake experienced extensive hydrothermal alteration under relatively oxidizing conditions. The insoluble organic matter (IOM) in these lithologies has the highest aromaticity [2, 3], and the lowest bulk H/C ratio and δD value of any C1-2 [4].

Previously, we reported very different elemental and isotopic compositions for IOM from three new lithologies in the Tagish Lake meteorite [5] that have experienced less but varied degrees of alteration than the bulk of Tagish Lake [6]. The IOM in these lithologies had a wide range in H/C ratios (0.46-0.77) and δD values (790-1830 ‰), but relatively constant C and N elemental and isotopic compositions. The IOM contents of the three lithologies are also very similar. Here we report the elemental and isotopic compositions of a fourth lithology (IIh), and the results of $^{13}$C CP NMR studies of the first three lithologies.

**Results:** The IOM in the new lithology has a very similar C and N isotopic composition, N/C ratio and IOM abundance to the other three lithologies. Its H/C ratio (0.59) and δD value (1470 ‰) fall between those of the IOM from the least and intermediately altered lithologies in the earlier study. The data for all lithologies and our previous analysis of Tagish Lake [4] exhibit an excellent positive linear correlation between H/C and δD. There is also an inverse correlation between the extent of hydrothermal alteration and H/C and δD. The abundances of isotopic hotspots and globules in IOM [7], and the abundances and compositions of soluble organics in the lithologies [8] are also functions of the degree of alteration.

As might be expected, the NMR studies reveal that there is a clear correlation between the abundance of aliphatic material in the IOM and the H/C ratio. The most altered lithology (IIv) has a highly aromatic structure that is similar to that of previously reported NMR results for Tagish Lake [2, 3]. The least altered lithology (5b) has an aliphatic content that is intermediate between those of typical CM/CI and CR chondrites.

**Discussion:** The very similar C and N isotopic compositions, N/C ratios and IOM abundances in all four new lithologies and the more typical Tagish Lake material suggests that all were derived from a common precursor. The major differences between them are the extents of hydrothermal alteration that they experienced. The correlation between degree of alteration, aromaticity, H/C ratio and δD suggests that there was a conversion of aliphatic to aromatic material during alteration, with little or no loss of C and N, and that this was accompanied by isotopic exchange with less D-rich water. This strongly supports our previous contention that parent body processes were largely responsible for the range of IOM elemental and isotopic compositions found in chondrites [4, 9]. The apparently relatively facile conversion of aliphatic to aromatic material in IOM suggests that the aliphatic material has a fairly aromatic-like structure so that there was a minimum of C-C bond breaking during the transformation.

**References:** [1] Brown P.G. *et al.*, (2000) *Science* **290**, 320. [2] Cody G.D., Alexander C.M.O'D., (2005) *GCA* **69**, 1085. [3] Pizzarello S. *et al.*, (2001) *Science* **293**, 2236. [4] Alexander C.M.O'D. *et al.*, (2007) *GCA* **71**, 4380. [5] Herd C.D.K. and Alexander C.M.O'D., (2009) *M&PS* **44**, A88. [6] Blinova A. *et al.* (2010) *LPS.* **41**, #2140. [7] de Gregorio B. *et al.*, (2010) *73rd MetSoc.* [8] Glavin D.P., (2010) *73rd MetSoc.* [9] Alexander C.M.O'D. *et al.*, (2010) *GCA* **74**, In press.