

THE INTRIGUING METEORITE WIS91600 AS OBSERVED FROM AN ORGANIC PERSPECTIVE

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Introduction: The meteorite WIS91600 has been identified as an ungrouped carbonaceous chondrite C2 with a reflectance spectrum consistent with D- or T-type asteroidal precursor [1]. The mineralogy of this chondrite differs from CM chondrites [2], but is similar to Tagish Lake and some with Orgueil in regards to the types of hydrated matrix phases present [1].

Given these physical and mineralogical characteristics, it is worth comparing the chemical features of insoluble organic matter (IOM) in WIS91600 with those of the other carbonaceous chondrites to aid interpretation of the origin and chemical history of this unusual meteorite. We report elemental, isotopic, and structural characteristics of the IOM from WIS91600.

Experimental: IOM from WIS91600 and the other carbonaceous chondrites were prepared by demineralization of the bulk meteorites using a CsF-HF technique [3] followed by desulfurization in air, rinsing (with HCl, Milli-Q water, and dioxane), and drying. Elemental and isotopic compositions of the IOM were measured by elemental analyzer (C and N) or thermal conversion elemental analyzer (H and O) coupled with isotope mass spectrometry. Chemical structures of the IOM were analyzed by solid-state ^{13}C NMR and pyrolysis-GC-MS, respectively.

Results and discussion: Elemental and isotopic analyses [4]: H/C ratio of the IOM from WIS91600 was 0.41, which was similar to that (0.42) of the mildly-heated CM, Yamato (Y-) 793321. The value was between that from Tagish Lake (0.33) and those of the non-heated CM (0.6 – 0.7). $\delta^{13}\text{C}$ of WIS91600 IOM (-11.19‰) was also similar to that of heated CM, PCA91008 (-11.38‰). Its δD (349‰) was at the similar level of those of PCA91008 (243‰) and Tagish Lake (596‰).

^{13}C NMR: The NMR spectrum of WIS91600 IOM is dominated by aromatic carbon, similarly to that of the heated CM Y-793321 [5], laboratory-heated Murray [6], and Tagish Lake [7]. The variable contact time behavior of WIS91600, however, differs significantly from that of Tagish Lake, CMs, CRs, and a CI [3], but is similar to that of at least partially-heated CV chondrites (e.g., Vigarano).

Pyrolysis-GC-MS: The pyrolysis yield from WIS91600 IOM was low and the molecular distribution was very simple, which was similarly observed in IOMs from heated chondrites and Tagish Lake. This is completely distinct from the pyrolytic behavior of most of CM, CI, and CR chondrites [8].

Integrating these results, we conclude that WIS91600 IOM reveals a history that includes mild-heating and/or chemical oxidation. Further multilateral investigations including chemical degradation, carbon-XANES, and Raman would be necessary.

References: [1] Hiroi T. et al. 2005. Abstract #1564. *36th Lunar & Planetary Science Conference*. [2] Brearley A. J. 2004. Abstract #1358. *35th Lunar & Planetary Science Conference*. [3] Cody et al. 2002. *Geochimica et Cosmochimica Acta* 66: 1851-1865. [4] Alexander C. M. O'D. et al. 2007. *Geochimica et Cosmochimica Acta* in press. [5] Yabuta H. et al. 2005. *Meteoritics and Planetary Science* 40: 779-787. [6] Yabuta H. et al. 2007a. *Meteoritics and Planetary Science* 42: 37-48. [7] Cody and Alexander, 2005. *Geochimica et Cosmochimica Acta* 69: 1085-1097. [8] Yabuta H. et al. 2007b. Abstract #2304. *38th Lunar & Planetary Science Conference*.