Origin of large soluble molecules in Murchison chondrite.

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Organic matter in Murchison is made of thousands of compounds varying in mass up to 2000 Da [1]. Their size is in-between the molecules detected in space [2] and macromolecules in meteorites [3]. They have recorded signatures of complexification during the transition from the dense molecular clouds to the disk. We seek signature related to one stage of the meteoritic material evolution.

65 g of Murchison were macerated in Methanol and Toluene (1:2) for 1 week. Extracts were recovered after centrifugation and stored in glass tubes. Mass spectra were acquired with a Thermo LTQ Orbitrap XL coupled with an Electrospay ionization (ESI) source, in the 150-1000 m/z range at resolving power $m/\Delta m=100000$.

Detected ions are in the 150-750 Da range. The average mass is ~350 Da and the average diversity is 5.1 ions per Da. Each mass detected bears at least NH, the maximal number of heteroatoms is 2 for N and 3 for O. The average H/C is 1.6 regardless of the mass. There is no convergence toward macromolecular-like low saturation. We interpret the periodicity in mass as a repetition of stoichiometric patterns. CH_2, H_2 and C_5H_8 are the most frequent. Chain rearrangements, cuts and cycling signatures with limited loss of hydrogen are all together consistent with randomized additions of CH_2 and H_2. This can occur on grain surface [4]. PDR can provide an efficient C bonds cut mechanism [5].

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