Synthesis of the hydrocarbon backbone of an analogue of meteorite IOM

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Carbonaceous meteorites are the most primitive objects of the solar system. They contain up to 4% of carbon, mainly occurring as insoluble organic matter (IOM). This IOM contains key information about the organo-synthesis processes taking place in the Solar system, which are so far poorly understood. Its chemical structure was recently investigated using a combination of analytical approaches including various spectroscopic methods, chemical and thermal degradations and high resolution transmission electron microscopy observations. This led us to propose a model for the IOM chemical structure[1] and a synthesis pathway.

To test experimentally this pathway, we submitted hydrocarbons to a plasma discharge under vacuum. 15% of this precursor was converted into OM among which 85% is insoluble. Solid state ^{13}C NMR and pyrolysis GC-MS analysis of this synthesized IOM revealed that aromatic moieties are produced in the gas phase and pointed to strong similarities at the molecular level with the hydrocarbon skeleton of Murchison IOM. These results strongly support the proposed synthetic pathway for meteorite IOM. Additional characterization of the synthesized IOM is in progress using the same analytical techniques as those previously used for Murchison. They will allow a deeper comparison of the two materials especially with respect to the aliphatic chains.

[1] Derenne and Robert, 2010 *MAPS*, **45**, 1461-1475