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The molecular structure of the insoluble organic matter isolated from Murchison carbonaceous chondrite.

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During these last 10 years, our group has characterized the various molecular moieties of the insoluble organic matter (IOM) isolated from carbonaceous meteorites with the aim of reconstructing its overall molecular structure. Indeed, a precise knowledge of the structure of an organic macromolecule contains irreplaceable information that traces its mechanisms of synthesis and its conditions of formation. Such a modelled structure will be presented.
Carbonaceous chondrites contain up to 3 wt % of carbon that is under the form of soluble and insoluble fractions. The IOM, which constitutes more than 75 wt% of the bulk organic matter, was isolated from the bulk rock through successive acid dissolutions. The chemical structure of the isolated IOM has been studied by both (1) destructive and (2) non destructive methods. Methods include thermal and chemical degradations followed by GC/MS, spectroscopic techniques (nuclear magnetic resonance, Fourier transform infra red spectroscopy; X-ray absorption near-edge spectroscopy, electron paramagnetic resonance) along with high resolution transmission electron microscopy. Although each technique alone cannot provide definite information on the chemical structure of such a complex material, the combination of the results can be used to reconstruct the molecular structure of the IOM. The proposed structure accounts for all these measured parameters.
The details of this structure reveal information of the conditions of its formation in space and allow to discuss the mechanisms of organo-synthesis in the cosmochemical context of the formation of the solar system.