

Chemical structure and isotopic distribution of insoluble organic matter from Murchison and Allende meteorites revealed by pyrolyses

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Insoluble organic matter (IOM) is the main component of organic materials in carbonaceous chondrites and has isotopic heterogeneity [1, 2]. In order to reveal the chemical structure and isotopic distribution of IOM, we performed pyrolytic study for IOM from 2 different types of chondrites, Murchison (CM2) meteorite as pristine IOM, and Allende (CV3) meteorite as decomposed IOM [3, 4]. Stepwise (isothermal) and gradual (non-isothermal) pyrolyses [5] up to 800°C were performed for the IOMs. Pyrolysates were analysed by GC-MS and residues were analysed by IRMS and EA.

Murchison IOM produced various pyrolysates such as aliphatic hydrocarbons, aromatic hydrocarbons, N-S-O-bearing compounds and heterocyclic hydrocarbons, and light gases. Some aliphatics, aromatics and S- and O-bearing compounds were released at comparatively lower temperature and N-bearing compounds were released at higher temperature. The former compounds were derived from labile part of the IOM and latter and the residue were from refractory part. The labile part has higher δD , $\delta^{13}C$, and $\delta^{15}N$ values than the refractory part.

Allende IOM showed almost the same variety of pyrolysates as the Murchison IOM, excluding the absence of some N-S-O-bearing compounds such as HCN. However, the amount of pyrolysates was less than the Murchison IOM. The labile part of the Allende IOM has higher $\delta^{15}N$ value than the refractory part, but did not show substantial heterogeneity of D and ^{13}C .

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