Journey of organic compounds from interstellar clouds via asteroid parent body to Earth as evidenced from Hydrocarbons in Mukundpura Carbonaceous Chondrite

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Large organic molecules are formed in the interstellar Giant Molecular Clouds where all the ingradients are present and right conditions of temperature and pressure prevail for their synthesis. When our solar system was formed from fragmentation and collapse of the molecular cloud, these molecules were carried in and accumulated into the proto planetary bodies and asteroids. Study of Mukundpura (MK) carbonaceous (CM2) chondrite [1,2] which fell in Jaipur, on 6th June 2017, shows that these molecules remained preserved on the parent asteroid for the past 4.5 billion years in spite of severe hydrous conditions and temperature fluctuations [3].

Total organic carbon, type of kerogen and the distribution of polyaromatic hydrocarbons (PAH) in soluble organic matter were studied in this meteorite. The total organic carbon content (TOC) and bulk rock properties were analyzed. The abundance of organic carbon content (1.25 wt.%) is consistent with those obtained for other CM2 carbonaceous chondrites. The Tmax and HI data suggest that the organic matter in MK is type III-IV immature kerogen. The soluble polyaromatic hydrocarbons (PAHs) in MK analyzed using Gas Chromatography-Mass spectrometry (GC-MS) show high yields of PAHs with presence of 2, 3, and 4 ring polyaromatic hydrocarbons along with heterocyclic nitrogen and sulfur containing compounds. High degree of alkylation in MK indicates that the meteorite has suffered an extreme alteration due to water present on its parent asteroid but temperature was low (<250 ^{o}C) and thermal variations were too mild to result in any loss of organic molecules, even while it journeyed through the chaotic processes of planetary formation, ejection from the parent body and travelled through the interplanetary space, to finally land on the Earth.

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