D/H composition of polycyclic aromatic hydrocarbons across carbonaceous chondrites

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The stable isotopic composition of soluble and insoluble organic material in carbonaceous chondrite meteorites has been used both to gauge terrestrial contamination and to help deduce organic molecule provenance [1, 2]. Deuterium enrichment in meteoritic organics may be a residual sign from synthetic reactions occurring in the cold interstellar medium, or an indicator of hydrothermal parent body reactions [3, 4]. D/H ratios have been measured in carbonaceous grains and bulk samples in a wide range of meteorites [2, 5], however, these organic reservoirs are highly variable and subject to fractionation during subsequent thermal and aqueous alteration. The D/H ratio of polycyclic aromatic hydrocarbons (PAHs) may preserve information about both their formation environments and the influence of parent-body processes. This diverse class of compounds likely share common origins contemporaneous with parent-body formation [6]. While PAHs are abundant in carbonaceous chondrites, the hydrogen isotope composition of these compounds has only been measured in two CM2 chondrites [7]. This work aims to begin to understand the D/H ratio in PAHs in a variety of carbonaceous chondrites representing a range of petrologic types and to investigate potential links between the molecular distribution and D/H ratio of PAHs, the D/H ratio of bulk meteorites, and the extent and type of alteration of the meteorite. A consideration of these isotopic values in the context of alteration history and the additional organic complement of the carbonaceous chondrite may indicate the reliability of these compounds as indicators of deuterium enrichment during formation.

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