Which carriers for the diffuse interstellar bands

Alain Omont

1 Institut d'Astrophysique de Paris, UPMC Univ. Paris 06 & CNRS, UMR7095, F-75014, Paris, France

About 500 diffuse interstellar bands (DIBs) have been listed. However, almost one century after their first detection, the carriers of 99% of the DIBs remain unidentified. This leaves unexploited a rich information about diffuse interstellar clouds. After the confirmation of the identification of C_{60}^+ as the carrier of five DIBs [1-5], I review the prospects for further carrier identifications among the main classes of candidates, PAHs, long carbon chains and especially fullerene compounds, stressing needed information from laboratory and theoretical work. PAHs have the advantage of very large abundances in various charge and ionization states; they remain key candidates although they may be distributed in many individual molecules and more than 20 years of laboratory spectroscopy have not provided a single match with a DIB. Carbon chains display spectral properties and very strong oscillator strengths which might fit very well with DIBs; but stability in interstellar UV needs very long chains which are difficult to produce and whose laboratory spectroscopy is not complete. I briefly review the possible interstellar fullerene compounds and their charged counterparts, including metallofullerenes, heterofullerenes, fulleranes and adduct compounds with carbon chains or PAHs [6, 7]. Many uncertain processes make it difficult to assess their abundance, composition and size distribution. Nevertheless, it is concluded that the general landscape of interstellar fullerene compounds is probably richer than heretofore realized. They have many properties necessary to be suitably carriers of DIBs and some could significantly contribute to weak DIBs. While the lack of spectral data prevents any definitive conclusion, it should be important to study their spectrum and stability by theoretical modelling and through laboratory studies, including matrix and especially gas-phase spectroscopy.

Références