DIFFUSE INTERSTELLAR BANDS

PETER J. SARRE, *Department of Chemistry, The University of Nottingham, University Park, Nottingham, NG7 2RD, United Kingdom.*

The unidentified diffuse interstellar absorption bands are observed in near-UV, visible and near-IR spectra recorded towards stars that are partially obscured by interstellar dust. Their origin is the longest standing problem in astronomical spectroscopy, dating back to the 1930s when systematic study of the bands first started. The absorptions are known as diffuse bands because their widths are greater than those arising from transitions in known atoms and molecules observed along the same lines of sight. There has been an ongoing controversy as to whether the carriers are free gas phase molecules or are associated with the dust grains which cause the extinction of starlight. Proposals for the carriers range from molecular hydrogen to porphyrins and from colour centres to impurities on grains. Evidence considered to be in favour of molecules as carriers has grown in recent years and includes the invariance of the absorption wavelengths and narrowness of some of the bands, the lack of polarisation structure across a band, and the discovery that some of the diffuse bands are seen in emission from a peculiar nebula, the 'Red Rectangle', and an R CrB star V854 Cen at minimum light. Recent observations include wavelength and spatially resolved 'diffuse band' emission from the Red Rectangle, complementary recordings of the 3.3 μm 'unidentified' infrared (UIR) emission band, and ultra-high resolution absorption spectra of some of the narrower diffuse bands which are found to exhibit fine structure. In each case the data provide clues as to the nature of the carriers.