

THE C–H OUT-OF-PLANE BENDING MODES OF PAH MOLECULES IN ASTROPHYSICAL ENVIRONMENTS

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We have obtained mid-IR spectra of a sample of H II regions, YSO's and evolved stars that show strong UIR emission features, using the ISO/SWS spectrograph. These spectra reveal many weaker bands, several of which can be identified as being due to C–H out-of-plane bending modes of polycyclic aromatic hydrocarbon molecules (PAHs). The wavelength position of these bands depends on the the number of adjacent C-H bonds (Hudgins & Allamandola, 1999, Apj, 516, L41). These modes are thus sensitive probes of the edge-structure of the PAHS, and therefore an important diagnostic of the types of molecules that form in stellar outflows and survive the conditions in the interstellar medium. We find that the ratio between the singlets; *without* neighbouring C–H bonds, and the multiplets; *with* neighbouring C–H bonds, strongly varies between the different types of sources. The singlet band, at 11.2 μm is strongest in the evolved stars and weakest in the H II regions relative to for example the triplet feature at 12.7 μm . These differences can be understood as dehydrogenation of the PAHs or in terms of wavelength shifts of these bands due to ionization. The study of these bands in combination with the ionization sensitive C–C stretch mode at 6.2 μm will therefore not only provide insight in the aromatic material that is present in astronomical environments, but also in their excitation conditions.