SPATIAL VARIATIONS OF THE 3 μm EMISSION FEATURES WITHIN NEBULAE

A. Moorhouse,* T.R. Geballe,** L.J. Allamandola,***
A.G.G.M. Tielens,*** and P.W.J.L. Brand,*

* Department of Astronomy, University of Edinburgh, Blackford Hill, Edinburgh, EH9 3HJ, Scotland.
** Joint Astronomy Center, 665 Komohana Street, Hilo 96720, USA.
*** NASA Ames Research Center, Moffett Field, California 94035, USA.

We present 3 μm spectra of the Orion bar region and the Red Rectangle. In both objects spectra were obtained at more than one location, corresponding to different distances from the excitation source. The well known 3.3 μm and 3.4 μm emission bands are seen in both objects as well as the recently discovered features at 3.46, 3.51 and 3.57 μm in the Orion's bar spectra. The spectra show that the relative strengths of the 3 μm emission features vary within Orions bar. As distance from the exciting star increases, the 3.4 μm and 3.51 μm features increase, and the 3.46 μm feature decreases in strength, relative to the strong 3.3 μm feature. There are two possible interpretations which we postulate, each of which involves the breaking of bonds by UV radiation, which removes the modes responsible for the 3.4 μm emission near the star. The two possible bond ruptures are (a) the CH bond in small PAHs, or (b) the bond to an aliphatic subgroup. It has to be pointed out that neither interpretation appears entirely satisfactory. The vibrational overtone interpretation cannot explain the presence or behaviour of the 3.46 μm feature, whereas the laboratory spectra of aliphatic sidegroups contain many more features in the 3 μm region than are observed in the astronomical sources.