

PURE ROTATIONAL SPECTROSCOPY OF PANHs I: 1,10-PHENANTHROLINE. IMPLICATIONS OF PANHs IN ASTROPHYSICAL ENVIRONMENTS AND OBSERVATIONAL SPECTRA

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Polycyclic aromatic hydrocarbons (PAHs) have been proposed as possible carriers of the diffuse interstellar bands, the unidentified infrared features, and as likely precursors for the recently-observed C₆₀ and C₇₀ fullerenes. While PAHs have been well studied in the laboratory, and ultraviolet through infrared spectral simulations of PAHs can reproduce astronomical spectra reasonably well, several discrepancies still exist. Nitrogen-substituted PAHs, PANHs, have been proposed as a possible explanation for one of the major differences: the peak position of the 6.2 μm feature. While identification of individual PAH and PANH species from infrared spectra alone is extremely difficult, identification in the mm and sub-mm regimes using heterodyne spectroscopy is far more feasible. The frequently low (or zero) dipole moment of PAHs makes pure-rotational laboratory measurements and astronomical observation difficult. PANHs, however, often have substantial dipole moments, making them ideal targets for laboratory and astronomical studies. We present here the results of a laboratory study of the PANH 1,10-phenanthroline using direct absorption mm/sub-mm spectroscopy. We discuss implications of these results for the astrochemistry of PAHs and PANHs and astronomical searches for such species at radio through (sub)mm wavelengths.