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

BRETT A. MCGUIRE, IAN A. FINNERAN, P. BRANDON CARROLL, *Department of Chemistry, California Institute of Technology, Pasadena, CA 91125*; and GEOFFREY A. BLAKE, *Divisions of Geological & Planetary Sciences and Chemistry & Chemical Engineering, California Institute of Technology, Pasadena, CA 91125*.

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 C_{60} and C_{70} 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.