ELECTRICAL DISCHARGE OF NITROGEN CONTAINING MOLECULES: A DETAILED STUDY OF THE DISCHARGE PRODUCTS OF PYRROLE AND PYRIDINE

EVA GOUGOULA, DONATELLA LORU, GAYATRI BATRA, MELANIE SCHNELL, *FS-SMP, Deutsches Elektronen-Synchrotron (DESY), Hamburg, Germany*.

Five- and six-membered aromatic rings have received significant attention in the exploration of interstellar space. Not only have recent detections expanded our understanding of interstellar chemistry but also highlight the timeliness and importance of investigation of the laboratory rotational spectra of such molecules. Following the detections of cyclopentadiene[1] and benzene[2] via rotational and infrared spectroscopies, respectively, their respective nitrogen containing analogues, pyrrole (C_4H_5N) and pyridine (C_5H_5N), call for extensive investigation of their rotational spectra as well as their chemistry under harsh energetic conditions.

Here, we present a detailed study of the products of pyrrole (C_4H_5N) and pyridine (C_5H_5N) generated through electrical discharge of the precursors and supersonic expansion. The spectra of the resulting species are simultaneously recorded with a Chirped Pulse Fourier Transform Microwave (CP-FTMW) Spectrometer operating in the 18-26 GHz frequency region.[3] The observed species, varying from cyclopropene to linear cyanopolyynes, contain both fewer and more, or the same number of carbons as their respective precursors suggesting that both fragmentation and recombination processes take place during electrical discharge. Our results support the detection of related molecules in the interstellar medium which may also provide an insight into potential pathways around their formation.

[1] Cernicharo, J., Agúndez, M., Cabezas, C., Tercero, B., Marcelino, N., Pardo, J. R. & de Vicente P. A&A. 649, L15 (2021)

[2] Cernicharo, J., Heras, A. M., Tielens, A. G. G. M., Padro, J. R., Herpin, F., Guelin, M. & Waters, L. B. M. Astrophys. J. 546, L123 (2001)

[3] Fatima, M., Perez, C., Arenas, B. E., Schnell, M. & Steber, A. Phys. Chem. Chem. Phys. 22, 17042-17051 (2020)