EXPLORING THE FORMATION OF SILICON DERIVATIVES OF AROMATIC AND POLYCYCLIC AROMATIC HYDROCARBONS IN THE ELECTRICAL DISCHARGE OF PHENYL SILANE

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Silicon is one of the most abundant elements in the Earth's crust and is also prevalent in space in the form of gaseous molecules, interstellar dust, and ice grains. The recent radio astronomy detection of cyano-substituted benzene, e.g., benzonitrile [1] in TMC-1 has accelerated the search for substituted aromatic molecules in the interstellar medium. Considering the presence of silicon in the interstellar medium, silicon-containing aromatic molecules are likely targets of future astronomical searches. To aid these searches and understanding the silicon chemistry in space, laboratory data are crucial.

In the laboratory, exotic neutral silicon-containing molecules can be produced and spectroscopically characterized by combining spectroscopic techniques with electrical discharge sources. In this work, using mass-selective IR-UV ion dip spectroscopy coupled with a molecular beam and the free electron laser FELIX (Nijmegen, The Netherlands), we have investigated the electrical discharge chemistry of phenyl silane in selected IR regions (500 – 3200 cm^{-1}) [2]. Such broad coverage provides significant information about the structure and chemical composition of the discharge products formed in the experiment. The aim is to investigate the variety of discharge products generated by the electrical discharge experiment of pure phenyl silane. Numerous fragments, products, and reaction intermediates are identified by mass-selective IR-UV spectroscopy combined with quantum-chemical calculations.

[1] B.A. McGuire, A.M. Burkhardt, S. Kalenskii, C.N. Shingledecker, A.J. Remijan, E. Herbst, M.C. McCarthy, Detection of the aromatic molecule benzonitrile (*c*-$\mathrm{C_6H_5CN}$) in the interstellar medium, Science. 359 (2018) 202–205.

[2] A.K. Lemmens, D.B. Rap, J.M.M. Thunnissen, B. Willemsen, A.M. Rijs, Polycyclic aromatic hydrocarbon formation chemistry in a plasma jet revealed by IR-UV action spectroscopy, Nat. Commun. 11 (2020) 269.