EXPLORING THE FORMATION OF SILICON-CONTAINING PAH-LIKE MOLECULES IN THE ELECTRICAL DISCHARGE OF PHENYLSILANE AND NAPHTHALENE

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Silicon is among the most abundant elements in interstellar environments, being only one order of magnitude less than C, N, and O. More than 15 gas-phase silicon bearing molecules have been already detected and a large fraction of silicon is considered to be locked up in interstellar dust grains, where also polycyclic aromatic hydrocarbons (PAHs) are a major constituent. Due to its abundance, silicon can represent an important player in the chemical evolution of the interstellar medium and, in particular, in many interstellar PAHs formation zone. Because of its chemical analogy with carbon, both are tetravalent atoms that form primarily covalent bonds, silicon could substitute either within or on the carbon skeleton of a PAH under the energetic conditions of the ISM, and silicon-substituted PAHs could represent promising candidates for future astronomical searches. In the laboratory, one way to study the make-up of silicon containing PAH-like molecules is by combining cutting-edge spectroscopic techniques with plasma sources. In this work, we used molecular beam mass-selective IR spectroscopy with the free-electron laser FELIX and quantum-chemical calculations to analyze the electrical discharge of phenylsilane and naphthalene. A variety of molecular species resulting from the combination of the precursors were identified via their mass and their IR spectra. The analysis of the latter could help elucidate the influence of Si on the IR spectra of PAHs.