

Non-statistical Fragmentation of Pyrene-based Polycyclic Aromatic Hydrocarbons in collisions with He

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Polycyclic Aromatic Hydrocarbons (PAHs) are an important component of interstellar dust and gas but the processes by which PAHs and other large molecules are formed and destroyed in the interstellar medium are not yet understood. For example, collisions between PAHs and ions are thought to be important destruction mechanisms. Fragmentation cross-sections and the related dissociation energy barriers are mostly unknown. Experiments on collisions between PAH ions and atoms, particularly in the 100 eV energy regime, may elucidate the role of such collisions in the processing of interstellar carbon. In particular, we want to see the importance of non-statistical fragmentation processes, like single carbon knockout, over statistical channels since non-statistical fragmentation often yields different, more reactive fragments and may thus play an important role in the formation of larger molecules.

We have performed an extensive set of experiments on collisions between Pyrene-based ($C_{16}H_9R$ with $R = H_N, OH, NO_2$ and Br) cations and He atoms at center-of-mass energies around 100 eV. Density Functional Theory and Molecular Dynamics simulations are employed to interpret our results.