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Electron and Positron impact partial ionization cross sections of diatomic molecules present in the interstellar medium

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Looking at the starry night and wondering "Where and How did everything begin?" is always fun and intriguing for us. Although the question might look simple and clumsy, the answer looks far more complex and yet unknown. Mysteries of the origins of life from space are due to chemical processes that happen in the interstellar molecular clouds present in the interstellar medium (ISM) and the protoplanetary disks. The reason is, that these prime locations are rich in materials or compounds, and interstellar travelers like comets, clouds of dust, and meteors act as a vector in delivering such compounds to new environments such as the planetary atmosphere and then to the surface of planets itself, directly contributing to the development of life crucially [1]. Recently, Sanchez *et al.* [2] discussed the importance of LiX (X = H, He) and HeH in the ISM. The 2021 census of Brett A. McGuire [3] also features an extensive variety of molecules including diatomic species which were detected with radio astronomy in the ISM clouds, these cold clouds house several molecules in the gas phase, and ionization is one of the important processes due to the scattering of electrons, positrons, and photons in such an atmosphere. Albeit in literature, there exist numerous studies on elastic and inelastic scattering processes for known targets such as O_2, H_2, N_2, C_2, CH, CO, NH, and CN which were also detected at the ISM. However, for the other diatomic targets that were present in the 2021 census, we could not find any study on the PICS for these molecules which could give us a better insight into the chemistry of extreme environments. In this work, we study the total ionization cross sections (TICS) and partial ionization cross sections (PICS) [4, 5] for electron and positron impact on several diatomic molecules detected in the ISM employing the Binary Encounter Bethe (BEB) model [6] and references therein. In Figure. 1, We have shown the electron and positron TICS of the LiX group. So, we plan to present the electron/positron TICS and PICS to all the molecules from the aforementioned works of Brett A. McGuire and Sanchez.

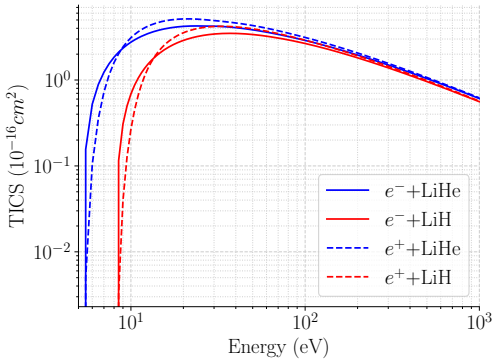

Figure 1: Electron and Positron impact TICS of LiHe (blue color) and LiH (red color)

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