PFI-ZEKE PHOTOELECTRON SPECTROSCOPY OF METASTABLE He_2: IONIZATION POTENTIAL AND ROVIBRATIONAL STRUCTURE OF He_2^+

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A supersonic beam of metastable He^* atoms and He_2^* a $^3\Sigma_u^+$ molecules has been generated using a pulsed discharge at the exit of a pulsed valve prior to the gas expansion into vacuum. Pulsed-field-ionization zero-kinetic-energy (PFI-ZEKE) photoelectron spectra of the He_2^+ X^+ $^2\Sigma_u^+$ $(v^+ = 0 - 2)$ $\leftarrow$ He_2^* a $^3\Sigma_u^+$ $(v'' = 0 - 2)$ transitions and photoionization spectra of He_2^* in the vicinity of the lowest ionization thresholds have been recorded. The energy level structures of $^4He_2^+$ X^+ $^2\Sigma_u^+$ $(v^+ \leq 2,\ N^+ \leq 23)$ and $^3He_2^+$ X^+ $^2\Sigma_u^+$ $(v^+ = 0,\ N^+ \leq 11)$ have been determined, and an accurate set of molecular constants for all isotopomers of He_2^+ has been derived in a global analysis of all spectroscopic data reported to date on the low vibrational levels of He_2^+.[b] The analysis of the photoionization spectrum by multichannel quantum defect theory has provided a set of parameters describing the threshold photoionization dynamics of He_2^* a $^3\Sigma_u^+$.

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