HIGH-RESOLUTION SPECTROSCOPY OF np RYDBERG STATES OF He_2: 2. AUTOIONIZATION DYNAMICS AND MQDT CALCULATIONS

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The threshold ionization spectra of He_2 (a $^3\Sigma_u^+$) reveal a dense structure of very sharp features that can be attributed to transitions to Rydberg states converging on the first ($N^+ = 1 - 7$) rotational levels of the $X^+\ ^2\Sigma_u^+$ ($v^+ = 0$) ground ionic state. Many of these states associated with rotationally excited levels of the ion core (rotational quantum number N^+) are embedded in the ionization continua associated with the $N^+ - 2$ and $N^+ - 4$ ionization channels. The rotational autoionization dynamics is complex and is strongly influenced by the application of weak electric fields. Several series are immune to ionization and the corresponding states are metastable. The energy level structure and the rotational autoionization dynamics have been analyzed by multichannel quantum defect theory (MQDT). An interpretation of the effects of the electric fields on the autoionization dynamics is proposed.