KINETIC INVESTIGATION OF COLLISION INDUCED EXCITATION TRANSFER IN Kr*($4p^5 5p^1$) + Kr ($4p^6$) AND Kr*($4p^5 5p^1$) + He ($1s^2$) MIXTURES

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Metastable rare gas atoms are gaining increasing interest for their potential in the development of optically pumped laser systems. Understanding the time evolution of excited rare gas states in a collisional environment is of importance for the possibility of exploiting them as the active laser species. Collisional deactivation rates for excited states of Kr*($4p^5 5p^1$) atoms colliding with ground state Kr ($4p^6$) and He ($1s^2$) have been measured by time resolved measurements of the laser induced fluorescence, following state selective excitation at room temperature. Collisional energy transfer for the Kr*($4p^5 5p^1$) + Kr ($4p^6$) and Kr*($4p^5 5p^1$) + He ($1s^2$) systems were investigated in a pulsed electrical discharge. Metastable Kr*($4p^5 5s^1$) was generated by electron impact excitation from the ground state. Using a pulsed tunable dye laser these metastable states were pumped to selected upper levels of the $2p_J$ manifold (Paschen notation) and time-dependent fluorescence decay data from pumped and collisionally populated levels were collected. The total and intramultiplet state-to-state collisional deactivation rate constants were derived from the experimental data and by numerical models. The experimental data were simulated by fitting to numerical solutions of a set of coupled differential equations describing the full collisional relaxation processes. State-to-state rate constants are reported.