KINETIC INVESTIGATION OF COLLISION INDUCED EXCITATION TRANSFER IN Kr*(4p55p1) + Kr (4p6) AND Kr*(4p55p1) + He (1s2) MIXTURES

MD. HUMAYUN KABIR and MICHAEL C. HEAVEN, Department of Chemistry, Emory University, Atlanta, GA 30322.

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*(4p55p1) atoms colliding with ground state Kr (4p6) and He (1s2) 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*(4p55p1) + Kr (4p6) and Kr*(4p55p1) + He (1s2) systems were investigated in a pulsed electrical discharge. Metastable Kr*(4p55s1) 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 2pJ 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.