ENERGY TRANSFER AND LASING OF THE LOWER Ar($3p^5 4p$) STATES IN Ar and He

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Pulsed lasing from optically pumped noble gas atoms has been demonstrated previously in our laboratory. The lasing relied on a three level scheme, which involved the two lowest energy states of the np^5(n+1)p configuration and the lowest energy state of the np^5(n+1)s configuration $^3P_2$. Population inversion was achieved using collisional relaxation by helium or argon at pressures near 1 atm. State-to-state energy transfer rate constants are required for modeling these systems. In this study, we have measured the energy transfer and quenching rate constants for the lower Ar($3p^5 4p$) states in collisions with Ar and He. The excited states were populated by pulsed laser excitation of metastable Ar atoms. The metastables were generated by a pulsed electrical discharge. Kinetic processes were interrogated using time-resolved laser induced fluorescence and dispersed fluorescence techniques. For Ar* in collision with Ar, our measured rate constants are in reasonable agreement with previously reported values. For Ar* with He, the rate constants had not been reported previously. We have also investigated the possibility of forming an Ar laser buffered with He or Ar and pumped by a CW diode laser. The lasing experiments will be reported, and the application of the measured rate constants to modeling the lasing system will be described.