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Excitation Transfer and Diffusion Property in a very Weakly Excited Lithium Gas[1] MONCEF BOULEDROUA, LAMIA REGGAMI, Laboratoire de Physique des Rayonnements — The aim of this study is a quantal computation of the diffusion coefficient D of excited lithium atoms Li(2p) in their parent gas Li(2s). The variation law of D with temperature T is also treated. The calculations are further extended to the determination of the excitation transfer cross section correlated with the process Li(2p)+Li(2s) $\rightarrow$ Li(2s)+Li (2p). To do so, we have constructed from recent RKR and/or ab initio data points the eight singlet and triplet potential energy curves through which an atom Li(2p) approaches Li(2s). In the short- and long-range regions, the data points are smoothly connected to the forms $\exp(-bR)$ and $1/R^n$, respectively. The phase shifts, obtained for each energy E and angular momentum l from the numerical integration of the radial wave equation, allow the calculation of the diffusion and excitation transfer cross sections Q_D and Q_{tr}. Our results show that the weighted cross sections vary with energy like $E^{-1/2}$ and the diffusion coefficient is found of the form $D \sim AT/n$, with n being the number density and A a constant. A semi-classical method shows $Q_D \simeq 2Q_{tr}$ and points out that the long-range R^{-3} forces are prominent in the diffusion of excited atoms in their parent gas.

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