Transport Properties of a Mott-like State of Molecules

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In Ref. [1] we showed the preparation of a Mott-like state of molecules. This state is a quantum state with exactly one molecule at each site of an optical lattice. We now study the transport properties in the Mott-like state. A molecule can tunnel with an amplitude $J_m$ to an adjacent site. If there is already another molecule at that site the molecules can collide inelastically [2], leading to loss of both molecules from the sample. This loss occurs with a rate coefficient $\Gamma$ which is typically much faster than $J_m/\hbar$. The fast on-site loss leads to a suppression of tunneling. Loss from the initial state effectively occurs with a rate $\Gamma_{\text{eff}} \propto J_m^2/\Gamma$. This effect is studied experimentally at different lattice depths and the results are compared with theoretical predictions.