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Success probability of atom-molecule sympathetic cooling: A statistical approach MASATO MORITA, University of Nevada, Reno, ROMAN KREMS, University of British Columbia, TIMUR TSCHERBUL, University of Nevada, Reno — Sympathetic cooling with ultracold atoms is a promising route toward creating colder and denser ensembles of polar molecules at temperatures below 1 mK. Rigorous quantum scattering calculations can be carried out to identify atom-molecule collision systems with suitable collisional properties for sympathetic cooling experiments. The accuracy of such calculations is limited by the uncertainties of the underlying ab initio interaction potentials. To overcome these limitations, we introduce a statistical approach based on cumulative probability distributions for the ratio of elastic-to-inelastic collision cross sections, from which the success probability of atom-molecule sympathetic cooling can be estimated. Our analysis shows that, for a range of experimentally relevant collision systems, the cumulative probabilities are not sensitive to the number of rotational states in the basis set, potentially leading to a dramatic reduction of the computational cost of simulating cold molecular collisions in external fields.

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