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Ultracold collisions of He with highly rotationally-excited CO_2[1]

W. EL QADI, B.H. YANG, P. C. STANCIL, University of Georgia, R.C. FORREY, Penn State University, Berks Campus, N. BALAKRISHNAN, University of Nevada Las Vegas — Elastic and rotationally inelastic processes are studied for collisions of rotationally excited CO_2 with He. In the ultracold limit, complex scattering lengths were computed for rotational levels up to $j = 200$ using the close-coupling method and the coupled-states approximation. As illustrative examples, some cross sections are also presented. This work was motivated by recent experimental efforts to generate highly excited CO_2 rotational states with an optical centrifuge [1] and the possibility of translationally cooling carbon dioxide with helium buffer-gas techniques. Experiments with rotationally excited and cold CO_2 may be feasible as the ratio of the real to imaginary components of the scattering length exceeds $\sim$30 for $j = 200$.

[1] A. S. Mullin, L. Yuan, S. Teitelbaum, and A. Robinson, APS Bulletin, DAMOP Abstract E1.00016 (2009).

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