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Isotope effects for complex scattering lengths of He-H_2[1] JEFF NOLTE, BENHUI YANG, PHILLIP STANCIL, UGA, TECK-GHEE LEE, ORNL, N. BALAKRISHNAN, UNLV, ROBERT FORREY, Penn State, ALEXANDER DALGARNO, ITAMP — In this study we examine the effects of varying the molecular mass on the complex scattering lengths in collisions of molecular hydrogen and He. The variation in the diatomic mass is effected by holding the mass of one atom constant while varying the mass of the other. Specifically, we examine the three cases where the fixed atom is one of the three isotopes of hydrogen; H, D, and T. For each species HX, DX, and TX, where X denotes the atoms of varying mass, we consider collisions with both ^{3}He and ^{4}He. By performing close-coupling calculations using the scattering program MOLSCAT and a three-dimensional He-H_2 Born-Oppenheimer potential energy surface, we obtain cross sections from which we can calculate the real and imaginary parts of the scattering length. In examining the scattering lengths withing this "reduced mass space," we observe zero-energy resonances for HX and DX where the mass of X is less than 1 amu. This reveals the presence of bound states below the dissociation limit of the He-H_2 complex which were previously predicted. We also examine the behavior of cross sections for individual state-to-state transitions.

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