

Collisions of H₂ with H, D, He, or H₂: Towards a Comprehensive Database

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Abstract. Molecular hydrogen can be a significant constituent in the interstellar medium, especially in giant molecular clouds. Since shocks in these clouds are associated with star formation, a detailed understanding of the collisional behaviour of molecular hydrogen is needed, particularly when competition with quadrupole emission is also considered. Work in this group has been focussed on the development of a comprehensive database of the relevant cross sections and rate coefficients. Detailed state-to-state cross sections and rate coefficients for energy transfer and state specific values for dissociation of H₂ in collision with each of atomic H, atomic D, He, and molecular H₂ have been calculated using quasiclassical trajectories and chemically accurate potential energy surfaces. The uncertainties of the cross sections are propagated rigorously to give uncertainties of the rate coefficients and the rate coefficients are parameterized as a function of temperature. Comparisons with quantum calculations are discussed and the proposed website is described.

Keywords. molecular hydrogen, energy transfer, collisional dissociation
