CALCULATION OF STATE-TO-STATE RATE COEFFICIENTS FOR $\text{H}_2(v,j) + \text{H}_2(v',j')$

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Rate coefficients for transitions among the $(v,j)$ states of molecular hydrogen as the result of collisions with other hydrogen molecules can be calculated from the corresponding cross sections. I have determined converged cross sections from quasiclassical trajectory results for the $(v,j)$ states of molecular hydrogen with internal energy of less than 1 eV. The chemically accurate potential energy surface of Keogh, Boothroyd, Martin and Peterson (Journal of Chemical Physics 95 4331 1991) was used for the trajectory calculations. Also discussed are issues in determination of thresholds to energy transfer, microscopic reversibility and the extension of the calculation to all combinations of $(v,j)$ states of the $\text{H}_2(v,j) + \text{H}_2(v',j')$ system. Application of the results to the master equation studies of shocked interstellar hydrogen is also considered.