SPEED-DEPENDENT EFFECTS ON THE LINE SHAPES OF ARGON-BROADENED HF

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Asymmetric line shapes have been observed for infrared transitions of Ar-broadened HF [a] and were fit to Dicke-narrowed profiles with an empirical partial correlation between velocity- and state-changing collisions. That analysis yielded measured broadening and shifting coefficients in excellent agreement with the thermally-averaged values calculated from exact quantum close-coupled scattering cross-section based on a realistic van der Waals potential [b]. However, some anomalies in the sense of the asymmetries and the magnitude and J dependence of the velocity-changing rates remained, which subsequently were addressed classically by Joubert et al. [c] and quantum mechanically by Demeio et al. [d]. Here, we reexamine those line shapes with the correlated speed-dependent strong-collision Dicke-narrowed profiles described above using the reliable energy-dependent cross-sections of Green and Hutson. For HF/Ar below one atmosphere, Dicke narrowing dominates the speed dependence.

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[b] S. Green and J. Hutson, J. Chem. Phys. 100, 891 (1994).
[c] P. Joubert, J. Bonamy, D. Robert, J. Domenech and D. Bermejo, JQSRT (to be published).
[d] L. Demeio, S. Green and L. Monchick, J. Chem. Phys. 102, 9160 (1995).