

Evidence for double incoherent Raman scattering in binary gas mixtures: SF6-N2

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R sum  en anglais

We report a collision-induced Raman band by room temperature gas mixtures of sulfur hexafluoride and nitrogen. The band is centered at the sum of the frequencies of the symmetric-stretching ν_1 transition of SF6 and the fundamental transition of N2, and its intensity scales as the product of the partial densities of the gases. The observed process is evidence of double incoherent Raman scattering (DRS) by SF6-N2, in which both molecules simultaneously undergo two Raman-allowed transitions. The band was found to be almost fully depolarized, in agreement with previous observations in other systems and with theoretical predictions. Its integrated intensity is about one-third higher than the total area predicted by the leading-order dipole-induced dipole model. This discrepancy suggests that DRS is a practical means of assessing the quality of intermolecular potential models, which, in the case of SF6-N2, is still believed to be not good enough. Our work is expected to open the door to a multitude of studies involving complicated processes encountered in nonpolar gases and their mixtures, which are of direct relevance to atmospheric research.

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