ON THE GENERAL FEATURES IN COLLISION-INDUCED SPECTRA OF N_2, O_2, AND CO_2

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Collision-induced absorption (CIA) in gases is generally believed to arise as a result of elastic molecular pair collisions. In some cases true dimers are recognized to contribute to the observed CIA, though the decomposition of CIA profiles into true bound and unbound pair contributions bears substantial ambiguity until recently. Present paper aims at drawing attention to the general features in CIA spectra which may throw a new light on the nature of CIA phenomenon. The retrieval of these features is supported by theoretical consideration of CIA spectra of N_2, O_2 and CO_2 taken recently at high resolution using FTIR technique.

First, the attention is drawn to the use of statistical physics partitioning to subdivide CIA intensity among true bound, quasibound and free pair contributions. It is demonstrated that in case of CO_2 the theory matches nicely the experimental observations as far as temperature variations of true dimers fraction are concerned. Second, the role played by line-mixing effect in the formation of CIA profiles is discussed. Moderate line-mixing in case of N_2 and O_2 fundamentals results in appearance of the so-called ripples in the room-temperature CIA spectra. In CO_2 the line-mixing is likely to symmetrize the background profile. Third, the mechanisms responsible for the shaping of the true dimer absorption profiles in CIA spectra are discussed. Attention is paid to nonrigidity of dimers as well as to specific selection rules $\Delta J = 3D0, \ \pm 1, \ \pm 3$ appropriate to induced absorption. Rotational predissociation effect and N and T branches are shown to manifest themselves in the dimeric constituent of the CO_2 CIA spectra in the region of the Fermi doublet.

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