LIFETIMES OF THE $\tilde{A}$ STATES OF C_3, C_3-NE, AND C_3-AR

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The fluorescence lifetimes of the $\tilde{A}$ states of C_3, C_3-Ne and C_3-Ar have been measured under supersonic molecular beam conditions. To minimize possible collisional quenching, the lifetimes of all three species were measured at a distance of about 42 nozzle diameters from the orifice. For all the vibrational levels of the $\tilde{A}$ state of the C_3 monomer, only J'=1 lifetimes were recorded, using R(0) lines. The accuracy of the lifetimes obtained was estimated to be better than 3ns. General features of the lifetimes of the C_3 monomer are as follows: with increasing excitation of the symmetric stretching vibration, the lifetimes increase to a maximum at v_1=4. Bending excitation reduces the lifetimes, though exceptions occur for the 0 v 0 and 1 v 0 levels. Among all the vibrational levels, 0 2^- 0, 0 4^- 0, and 0 2^+ 0 have the shortest lifetimes, similar to that of the origin level [a]. Lifetimes of the $\tilde{A}$ state of C_3-Ne and C_3-Ar have only been measured for features 1.5-2 and 11-14 cm^{-1}, respectively, to the red of the R(0) lines of the $\tilde{A}-\tilde{X}$ bands of free C_3. It is not possible to reduce the backing pressure while measuring lifetimes of the complexes; we therefore reduced the average pressure of the chamber to 1-2x10^{-5} torr by lowering the repetition rate. No sign of predissociation was found in the Ne complex except for the level 0 12^+ 0. The lifetimes of the complexes did not vary with vibration in the manner found for C_3 itself. The lifetime of the 0 2^- 0 level, one of the lowest vibrational levels of the $\tilde{A}$ state, was not affected by complexing with either Ne or Ar, consistent with the observation that the least van der Waals shifts were observed for this vibrational level [b].

[a] G. Zhang, K.-S. Chen, A. J. Merer, Y.-C. Hsu, W.-J. Chen, S. Shaji, and Y.-A. Liao, J. Chem. Phys. 122, 244308 (2005).
[b] G. Zhang, B.-G. Lin, S.-M. Wen, and Y.-C. Hsu, J. Chem. Phys. 120, 3189 (2004).