LIFETIMES OF THE Ā STATES OF C₃, C₃-NE, AND C₃-AR

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The fluorescence lifetimes of the ā states of C₃, C₃-Ne and C₃-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 ā state of the C₃ 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 C₃ monomer are as follows: with increasing excitation of the symmetric stretching vibration, the lifetimes increase to a maximum at v₁=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 ā state of C₃-Ne and C₃-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 ā−X bands of free C₃. 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 C₃ itself. The lifetime of the 0 2− 0 level, one of the lowest vibrational levels of the ā 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).