

ELECTRONIC SPECTROSCOPY OF ALUMINUM ATOM-MOLECULE COMPLEXES

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A review of recent work in our laboratory on the spectroscopy and dynamics of weakly bound complexes of aluminum atoms with various molecules will be presented. These complexes are prepared in a pulsed supersonic beam and probed with laser fluorescence excitation spectroscopy. Unlike Al-rare gas complexes, the atom-molecule complexes undergo predissociation. Resonance fluorescence is thus not detected, and the excitation spectra are observed by monitoring emission from lower atomic levels, or from electronically excited products formed by reaction within the complex. Spectra of several electronic transitions within the Al-M complexes, for M = H₂, D₂, N₂, CH₄, CD₄, will be presented and interpreted. The spectra are dominated by excited-state progressions in the van der Waals stretch vibrational mode. Estimates of Al-M binding energies for the various electronic states will be presented. In some cases, the Lorentzian linewidth is sufficiently small that partial rotational resolution was achieved. In particular, differences between the rotational structure of Al-H₂ and Al-N₂, which have T-shaped and linear equilibrium geometry, respectively, in the ground electronic state, will be discussed.