MICROWAVE SPECTROSCOPY OF WEAKLY BOUND COMPLEXES AND THE NATURE OF INTERMOLECULAR FORCES

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The high resolution spectroscopy of Van der Waals molecules has provided a valuable source of information on intermolecular interactions. In many cases this yields details of the structure of the complex and consequently information on the preferred relative orientation of the monomer units. In a few cases it has even proved possible to derive accurate intermolecular potential energy surfaces.
In this talk I shall present some of our recent investigations of such intermolecular interactions. First I shall discuss investigations of open-shell complexes, those containing the paramagnetic molecules NO, O_2 and NO_2. In each case the unpaired electron provides a valuable probe of the interactions within the molecule. Recent work on Ne-NO, Ar-NO, Kr-NO and O_2-OCS will be discussed. It will be shown that in some cases there is evidence of electron redistribution on complex formation and hence of some weak chemical bonding.
Another important area in which intermolecular forces are important is in biological systems. Here the species are frequently chiral and there is often evidence of chiral specificity in the intermolecular interactions. In this part of the talk I shall present some of the first rotationally resolved spectroscopic studies of small chiral systems where the stereospecificity of the intermolecular interactions can be investigated. Work on the chiral complexes of 2-butanol and on induced chiral effects in species like the ethanol dimers will be discussed.