DIODE LASER ABSORPTION SPECTROSCOPY OF FREE RADICALS AND IONS

P. B. DAVIES, *University of Cambridge, Department of Chemistry, Lensfield Road, Cambridge CB2 1EW, U.K.*

Over the past two decades diode laser absorption spectroscopy has been one of the most useful techniques for studying the infrared spectra of free radicals and ions at Doppler limited resolution. These transient molecules can be formed in low pressure discharges or by photolysis or thermolysis. Several new phosphorus bearing molecules have been formed in an atom-molecule flow system. It has been found that the oxygen-phosphorus chain reaction can be used for form molecules containing the P-O moiety. So far one or more bands of the molecules P_2O, PNO, ClPO and BrPO have been measured and analysed. The AC discharge (10kHz - 50kHz) continues to be a fruitful source of cations and anions, which are then detected by Velocity Modulation. By using air-cooled discharges many highly excited states are populated e.g. up to v = 6 in $SiCl^+$. Recent results on boron containing species will be described including $HBCl^+$ and $HBBr^+$. Neutral short lived molecules are detected in the same discharges using Population Modulation, such as the fundamental band of BO($X^2\Sigma$). Most studies of radicals in supersonic jets use discharges or laser photolysis or ablation to produce them. We have recently developed a thermolysis source to produce larger radicals in a jet. Using CH_3 as a test molecule the vibration - rotation spectra of its ν_2 mode revealed rotational temperatures of about 30K when the radical was formed at 1500K. Recent results on other species will be described.