ASU Highlights

The information provided by an analytical technique is constrained by the physical and chemical laws controlling the component processes. The use of this information, however, is largely controlled by technological constraints and we might speculate on how these influence our perception of what does or does not represent advancement. For example, had the ICP been developed 50 years ago with photographic detection, might we now be seeing its gradual decline in the face of new arc and spark excitation sources coupled with the latest spectrometric detection systems? Most analytical techniques provide far more information than is recognised and it is in the use of this information that modern technology makes it greatest impact. For example, improved measurement systems have facilitated the acquisition of spatially and temporally resolved absorption and emission signals and these are increasingly used in diagnostic studies of ETA, the ICP and the high-voltage spark where significant improvements in analytical performance have been demonstrated. We also note in this connection a continuing development in the techniques of chemometrics and the formation of a chemometrics group within the Analytical Division of the RSC.

The significant progress made recently in understanding the DCP has been further advanced by the application of a thermal pinch model to the discharge which provides new insights into hitherto unexplained spatial and excitation characteristics. There have been no significant technological developments in direct current excitation sources, but improved sputtering rates in a GDL, obtained by impinging a gas jet on to the sample surface, were worthy of note. The ICP continues to attract a major research effort and there has been solid progress on a number of topics, but no radical departures from existing lines of work. The studies of the role of water in determining the spatial and excitation characteristics of the axial channel of the ICP are welcome and there is further evidence that a plasma using a mixed Ar - N_2 coolant flow provides optimum overall performance. The air-cooled plasma, as expected, is being increasingly used for process-control monitoring. Diagnostic techniques employing lasers continue to be reported and a start has been made on using them to elucidate the mechanism of interference caused by the presence of easily ionisable elements in the ICP. Sample introduction techniques have again been the subject of many papers and notable this year has been the introduction of the Thermospray nebuliser. There have been no new developments in detection systems. The Fourier transform technique remains too expensive for most laboratories and although there have been advances in the dual plasma AFS technique, this has yet to be offered commercially. Inductively coupled plasma MS has continued to grow in popularity and users now appear to be much happier with the commercial instruments than they were previously. Although much effort has gone into the direct introduction of liquid aerosols into the MIP, this is not its forte and readers will be more interested in new spectral data for non-metals and the use of the MIP for evolved gas analysis.

Developments in flame spectrometry now largely depend on improvements to commercial instrumentation and therefore a study of calibration strategies used by various manufacturers is timely. Scattering interferences in flames have been the subject of a review. Hydride generation techniques remain popular and an electrothermal atomiser has been used to pre-concentrate hydrides prior to atomisation. Developments in chemical vapour generation increasingly make use of non-hydride forms with $SiCl_4$ and RuO_4 being reported this year.

The achievement of conditions for isothermal atomisation continues to be a focal point for research activity in ETA-AAS. Thus there have been further descriptions of platforms, probes and second surface atomisers. Mechanisms of atomisation have been investigated by a variety of techniques and the role of the atomiser surface and the partial pressures of O_2 and CO in the furnace have been evaluated. The combination of ETA with non-thermal excitation (FANES) shows considerable promise. Errors associated with the use of background correction have been discussed and the various techniques compared in a variety of applications.

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