IS FIA HERE TO STAY?

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The steady development of flow-injection analysis testifies to its major advantages over other analytical alternatives, namely versatility, simplicity, reproducibility, high sampling frequency, low sample and reagent consumption and cost, ease for implementation of continuous separation techniques, etc. Its affordability has also resulted in a negative trend: the mere adaptation of earlier manual methods without a clear analytical objective. FIA research should therefore be aimed towards aspects of interest to analytical chemistry, *viz.* (a) the improvement of troublesome analytical methodologies as regards sample and reagent consumption, selectivity, sensitivity and ingredient instability; (b) the consolidation of its theoretical foundation; (c) the development of new operational modes and configurations; (d) its application to real problems in the industrial, environmental, medical, agricultural, nutritional and pharmacological fields; and (e) the development of new, improved and more versatile FIA analysers.

Has FIA reached its height? Difficult though answering this question might be, one may consider that many of the papers recently published on FIA do not respond to the above aims. This may lead one to think that this analytical methodology is in fact undergoing a gradual 'depletion' of innovativeness. However, it is reassuring to see that a large number of novel FIA strategies [1] are opening up new perspectives. Both our monograph [2] and the revised version of Ruzicka and Hansen's [3] foresee an encouraging future for FIA provided work on this methodology is aimed towards innovation and workers do not rest on their laurels and live on past achievements.

There are several ways through which FIA can increase its analytical potential and ultimately its contribution to the growth of analytical chemistry. From the recent literature on FIA and the communications presented at the Flow Analysis IV meeting held in Las Vegas in April 1988 one may conclude that the most significant advances will foreseeably turn on the following aspects:

(1) Developments in the implementation of non-chromatographic separation

techniques aimed at improving valuable features such as sensitivity (preconcentration) and selectivity.

(2) Use of integrated reaction-detection systems, whether or not based on optical fibre. This will result in greater simplicity and hence in higher selectivity, sensitivity and sampling rate.

(3) Development of multi-determinations (i.e. determinations of several analytes in the same sample) to broaden the scope of application of FIA in areas such as clinical chemistry and environmetal pollution monitoring.

(4) Development of multi-detection systems based either on the use of fast detectors or on the iterative passage of the sample plug through the flow-cell. This will permit the implementation of multi-determinations and the automatic expansion of the conventional determinative range for each analyte.

(5) Miniaturization of flow-injection manifolds, a typical trend of late-century's technology.

(6) Use of FIA as a valuable alternative to the control of both industrial and non-industrial processes in the on-line mode (intermittent or continuous), thereby facilitating their monitoring in nearly real time.

(7) Direct introduction of solid and heterogeneous samples into FIA systems, thereby avoiding this tedious pretreatment stage. The use of ultrasounds has proven useful for this purpose in our laboratory.

(8) Alternate and joint use of FIA and HPLC in the determination of large numbers of samples, thus avoiding the exclusive application of this costly chromatographic alternative.

(9) Consolidation of FIA as an alternative to routine analyses in various areas as a result of research developments. This will require a greater extent of commercialization of analysers based on this technique.

Flow Analysis V, to be held in Kumamoto (Japan) in 1991, will hopefully, like previous meetings, offer a window for display of FIA innovations and open up new perspectives for this methodology.

REFERENCES

[1] F. Lázaro, M. D. Luque de Castro and M. Valcárcel, *J. Pharm. Biomed. Anal.* (in press).

[2] M. Valcarcel and M. D. Luque de Castro, *Flow-injection analysis. Principles and applications*, Ellis Horwood, Chichester, 1987.

[3] J. Ruzicka and E. H. Hansen, *Flow injection analysis*, 2nd ed., Wiley Interscience, New York, 1988.