SOME THOUGHTS ABOUT FIA IN 1986

Kent K. STEWART
Virginia Polytechnic Institute and State University, USA

These are exciting times for those of us who work in the area of Flow Injection Analysis(FIA). There are now over a thousand research and review articles and several books dealing with FIA. Three international meetings with major emphasis on the field have been held and a fourth is scheduled to be held in Las Vegas in 1988. A variety of short courses have been developed on Flow Injection Analysis including one sponsored by the American Chemical Society. Perhaps the most visible evidence that FIA has "come of age" is the existence of this publication, the "Journal of Flow Injection Analysis". Still we have much more to do! In this short article I will assess the stage of development of FIA and suggest biotechnology as an area for future FIA development.

FIA is viewed by most analyst as a curiosity, not as a tool for routine use. FIA could become a useful measurement tool for those who are interested in other studies if it were more suitable for routine use (i.e. commercial instrumentation available at reasonable cost which was dependable and rugged and not subject to annoying malfunctions). Many of the current FIA instruments lack dependability and/or ruggedness. Some systems have annoying malfunctions such as entrapment of air bubbles in detectors, problems with fluid leaks, and variable flow rates. Some of the instrumentation is expensive. The field needs better instrumentation.

The development of FIA methods for assays in biotechnology looks very attractive to the author. Biotechnology will probably be very active for several decades. It often requires large numbers of repetitive assays, and many appear to be adaptable to FIA systems. Several attributes of FIA which seem to be particularly useful for the biotechnologist should be mentioned. For example, many biotechnological studies have extremely limited

amounts of sample. Any analytical tool for biotechnology should have the capability of handling microliter to nanoliter samples. Compared to traditional analysis systems, the first generation FIA systems are already notable for how little sample volume is needed. It seems feasible that second generation FIA systems could be designed to handle even smaller samples for biotechnological analyses.

The current practices of manual batch sample handling preparation and derivatization in biotechnology are tedious and lead to imprecision and error. For example: The current practice of derivatizing amino acids in volatile solvents and then evaporating the solvents is primitive compared to the sophisticated HPLC systems used for the final stage of the analysis. It would be very useful if such manual preparation systems could be replaced with FIA in-line sample processing. Such a FIA system could eliminate the difficult manual manipulation, reduce the needed volume of sample, and improve the precision and possibly the accuracy and sensitivity. The initial studies on FIA enzymatic and chemical reactors suggest that such in-line processing of samples is feasible and can be useful.

Very few of the biotechnology analytical techniques have been optimized and many require better precision, accuracy, etc. Self-optimizing systems would be extremely helpful in the development of the many new techniques for biotechnology. The pioneering studies in computerized self-optimizing FIA systems suggest that they are excellent candidates for the optimization of the biotechnology analysis techniques.

SUMMARY: Flow injection analysis has become well known and shows considerable promise in many areas. The author suggests that better instrumentation is needed and that the development of FIA systems for biotechnological analysis is a promising area for future study. It is certain that the readers have already thought of other areas of equal or greater importance.

Note: In such a short article it is impossible to refer to all the significant papers. Thus, rather than slight some, I have referenced none.