Drawing from the Past - the Key to the Future of FIA

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In recent years, FIA has come to be regarded as, first and foremost, a technique that allows a sample to be prepared before measurements in a fast, low-cost and efficient way, as well as allowing the measurements to be carried out using different detectors and sensors. As a consequence, increasingly complex and sophisticated flow injection systems have been designed.

Progress in FIA instrumentation has been truly impressive. As a rule, different modules are incorporated into flow injection systems in order to perform such operations on a sample as digestion, separation, preconcentration, dilution, and mixing with other solutions. Increased interest has focused on multicommutated and multi-syringe flow systems, which are especially useful when low reagent consumption is required. Advances in the last decade in the field of new materials have been used, amongst other things, to construct original modern detectors dedicated to measurements in the flow mode. At the same time, developments in nanotechnology have been conducive to the tendency towards miniaturization of flow systems – a trend which has been noticeable for a long time. A special place in miniaturized flow injection analysis (μFIA) is occupied by lab-on-valve (LOV) devices, which work automatically with sequential injection to move micro volumes of reagents by stopping, reversing, and accelerating them in a way that is orientated towards sample preparation.

New FIA systems are usually proposed for use with various analytical procedures, which are either quite novel or already well know from batch analysis (including obligatory procedures that are national or international standards). In both cases they have a chance of being introduced into laboratory practice.

The instrumental and applied approach to flow injection analysis contrasts somewhat with the fundamental and theoretical approach which dominated in the early years of development of this field of analysis - in its, some would say, romantic period. At that time, a number of specific features of FIA, distinguishing it from other flow techniques, were defined and checked experimentally. Not only were its technical advantages noted, but also the interpretational opportunities created by a signal recorded in the form of an asymmetrical peak. It was noticed that particular points on the injection peak can be treated as a measure of local changes in concentrations of analyte in a segment of the sample and the whole peak as a picture of a sample of varying dilution in a carrier solution. This approach, known as the gradient technique, has been applied to e.g. improvement of detection limits and elimination of interference effects and has also become a basis for new procedures of titration and multicomponent analysis. Unfortunately, in the last 10-20 years, ever decreasing interest in this aspect of FIA has been noticeable.

FIA is also characterised by features that appear to be very useful for calibration purposes. Various possibilities of combining a sample with a standard solution, mixing them in any given proportions and at controlled dilution have meant that over a period of several decades, many ingenious calibration procedures have been developed, which have contributed not only to making the analytical process more efficient, but also to improvement in the accuracy and precision of analytical results. However, despite these advantages, FIA calibration is still commonly carried out in a manner imitating traditional batch calibration procedures.

Taking into account the above facts, it is worth considering whether, when developing FIA in the instrumental area, it would be advisable to make greater use of some of the concepts and methods that were developed long ago. For instance, many modern flow systems – in spite of their complexity and finesse – can operate using various FIA calibration modules as well as can exploit the gradient technique to improve analytical performance. Such a complete application of theoretical, methodological and technological advances can not only speed up further progress in FIA, but also win it many new advocates.

In 2011, Kraków will be the venue for the 17th International Conference on Flow Injection Analysis. I would like to invite you to attend this meeting and express my sincere hope that the issues presented above will be reflected in some presentations and will also the subject of discussions amongst participants.