Analytical techniques and instrumentation pdf

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This news article was originally written in Spanish. It has been automatically translated for your convenience. Reasonable efforts have been made to provide an accurate translation, however, no automated translation is perfect nor is it intended to replace a human translator. The original article in Spanish can be viewed at La importancia de las nuevas técnicas analíticas y su instrumental de laboratorio Ver más artículos sobre: Equipment for laboratory The instruments evolve to offer fast and reliable resultsIn today's industry the need for rapid and reliable results make the laboratory instrumentation market is more dynamic daily. For this reason, providers are giving a quick response to the demands of automation, allowing measurements at lower levels, greater specificity and greater ease in the detection of any error which may present a product. Then we desgranamos some of those instruments and techniques used to achieve excellence in processes and that perfection in the final product.In this last period in areas of analysis, such as the food and pharmaceutical industry, are being introduced new equipment based, not so much in the traditional valuation techniques, but in others such as liquid chromatography. The teams are much more sophisticated, allowing to shorten the time in the generation of results, in addition to process a greater number of samples with the same team.Today, all analysis centres begin to have sophisticated equipment, as for example espectómetros of masses, which until recently only were in research centers. Instrumentation, research focuses on providing the new equipment market which allow to know the results in real time and each time more accurately.The GNP auto is one of the instruments that can measure the rate of acidity in the fluid, the content of chlorides, determine the contents of vitamins in a food or measure the pH.Specifically the GNP Karl Fischer (with this name to the method in which it is based), is the most useful for determining the content of moisture in fuel, solvents, gases and solids. Karl Fischer is a standard laboratory method for measuring the water content in mineral liquids. In this method, the water react quantitatively with the Karl Fischer reagent. When there is excess of iodine, the electric current can pass between two electrodes or plates of Platinum. In the sample water reacts with iodine. When the presence of water is higher, freely reacts with iodine: iodine excess depolarized electrodes, pointing to the endpoint of the test.The demand for a higher speed of processing of the samples is driving innovation, especially in the field of chromatography, which is the oldest technique of analysis. Although this technology has been widely reached adulthood, chromatographic separation methods and, in particular, the gas chromatography (GC) capillary and liquid chromatography of high resolution (HPCL) are used in virtually all chemical analysis laboratories, especially in combination with mass selection techniques. Concepts such as fast gas chromatography (GC Fast) or the fast liquid chromatography (Fast LC), which have begun to hear recently in the world of laboratories, exemplify the attempt to reduce analysis times to a minimum without sacrificing the quality of the results. In GC, rapid applications are feasible to the extent that it is possible to reduce the length and internal diameter of the columns. The development of new materials of filling of the columns based on carbon nanotubes and nanoparticles could improve the performance of chromatographic systems, but is a technology still in its infancy.Liquid chromatography improves the ability of separation and resolution, as well as significantly reduce the consumption of expensive or toxic organic solventsTo increase the capacity for analysis of complex samples, users are turning increasingly to the combination of different techniques, such as analysis of the space head, extraction LVI, direct termodesorción, microextracción in solid phase (SPME) or extraction by sorption with agitadoras magnetic bars. These techniques can be combined with multidimensional chromatography (GC-xGC), a technique in which columns are connected with different polarity, and the selection of masses, especially MS/Ms. This method perite capture ions and refragmentarlos to investigate them later in isolation.There is a development in the field of the HPLC, called liquid chromatography at a controlled temperature (TPLC) that may sound exotic, but that is now frequently used in the GC. There are several manufacturers that offer LC systems, whether new or updates of existing ones, which allow to carry out separations at different temperatures or with different temperature gradients. This separation capacity and resolution, as well as significantly reduce the consumption of expensive or toxic organic solvents can be improved. In this sense, a manufacturer of artificial flavourings has developed a method of liquid chromatography and determination of flavor in a column with programmable temperature oven. This method uses an eluent containing no organic solvents. Taste of the eluent tests carried out in parallel to the identification of the analytes, through a standard detector. Small Molecule Analytical Chemistry ANALYTICAL TECHNIQUES & INSTRUMENTATION We offer a wide range of small molecule analytical testing services including: Chromatography High Performance Liquid Chromatography (HPLC) Ultra High Performance Liquid Chromatography (UHPLC) Rapid Resolution Liquid Chromatography (RRLC) Wide range of HPLC detectors – UV, PDA, Fluorescence, CAD, RI, ELSD Chiral HPLCIon ChromatographyGas Chromatography (GC) Thin Layer Chromatography (TLC) Capillary Electrophoresis (CE) CFR Part 11 Compliant Chromatography Data Acquisition System Organic Spectroscopy Nuclear Magnetic Resonance Spectroscopy (NMR) Fourier Transform Infrared Spectrophotometry (FTIR) UV/VIS SpectrophotometryPolarimetry Near Infrared (NIR) Raman Spectroscopy Mass Spectrometry X-Ray Powder Diffraction Dissolution USP Apparatus 1, 2, 3, 4, 5, 6, 7 F2 Testing Biowaivers Intrinsic Dissolution Karl Fischer Volumetric Coulometric Evaporative Physical Testing Hardness Friability Particulates (HIAC) Osmolality/Osmolarity Disintegration Viscometers Particle Analysis Malvern Microscopy Sieving HIAC Cascade impaction Thermal Analysis Differential Scanning Calorimetry (DSC) Thermogravimetric Analysis (TGA) Dynamic Vapor Desorption (DVS) Metals Analysis Inductively Coupled Plasma Mass Spectrometry (ICP-MS) Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES/OES) Microwave Digestion Graphite Furnace Atomic Absorption Spectrometry (GFAAS) Cold Vapor Atomic Absorption Spectrometry (CVAAS) Flame Atomic Absorption Spectrometry (FAAS) Microscopy Light Microscopy Hot Stage/Optical Microscopy Cold Stage/Optical Microscopy Pulmonary and Nasal Blend/Content Uniformity Dose through Life Total Assay/Net Fill Aerodynamic Particle Size (ACI, NGI) Droplet Size, Particle Size Spray Pattern Plume Geometry Zeta Potential Microbiology Antimicrobial Efficacy Bioburden Container Closure Endotoxin Microbial Limits (MLT) Sterility Microbial Identification E-tongue Bitterness Prediction Taste Masking Placebo Matching Stability Storage & Testing In this issue of Momentum, we meet Kevin Schug, The University of Texas at Arlington (UT Arlington) Associate Professor of Chemistry and Biochemistry, Shimadzu Distinguished Professor of Analytical Chemistry and Shimadzu Science Advisor to the Vice President for Research. He tells us about his challenging research on the environmental effects of extracting shale gas in northern Texas and how Shimadzu instruments contribute to his work. “We have one of almost every analytical instrument produced by Shimadzu,” explains Schug. “Collaboration and partnerships with Shimadzu have been extremely productive in helping us meet our analytical goals.” The suite of instruments at the Shimadzu Center for Advanced Analytical Chemistry (SCAAC) include a TOC, a headspace gas chromatograph (headspace-GC), multiple GC-MS, multiple liquid chromatograph mass spectrometers (LC-MS), and an inductively coupled plasma optical emission spectrometer (ICP-OES). The SCAAC was opened on 9 April 2012 with Dr Kozo Miseki representing Shimadzu Corporation. The Center houses chromatography, spectroscopy, and mass spectrometry equipment worth US$6 million. Its mission is to provide support for science and engineering research to academia, government, and industry, either per sample or on a contract basis. It is part of UT Arlington's Shimadzu Institute for Research Technologies. The Institute is a $25.2 million (US) endeavor fueled by Shimadzu Scientific Instruments' $7.5 million corporate gift to the University and their previous in-kind gift of nearly $3 million in instrumentation. “I have used analytical equipment made by Shimadzu since my graduate school days”, says Schug. “I am able to act as a conduit for new research avenues for the Center and local researchers in academia and industry. I also coordinate partnerships between UT Arlington, Shimadzu Scientific Instruments, Inc., and Shimadzu Corporation.” The roots of Schug’s research are in chromatography but he is extending his work towards studies aimed at a better molecular level understanding of separation systems. An example is the improved methods under development for metabolite analysis based on hydrophilic interaction liquid chromatography. Electrospray ionization is another area of expertise for the Schug group. Here the goal is to develop increased throughput methods for measurement by mass spectrometry of non-covalent binding for high-efficiency drug discovery protocols. The applications of Schug’s research stem from his fundamental understanding of the advantages of combining high-efficiency separations with high-sensitivity mass spectrometry detection. Furthermore, Schug is optimizing on-line sample preparation using restricted access media, specifically the CoSense instrumentation set-up and MAYI semi-permeable surface phases, in conjunction with LC-MS workflows. “This approach is under-exploited in the United States,” says Schug. “We have first-hand experience of the significant benefits of direct injection of biological fluids for the determination of traces of small bioactive molecules.” Experiments on the determination of steroid hormones and endocrine disruptors from matrices, such as plasma, cerebrospinal fluid, urine, and saliva, show higher recoveries and improved detection limits using CoSense compared with off-line sample preparation techniques. The instrumentation at SCAAC has played a pivotal role in Schug’s research on the potential impact of industrial processes on the environment. These include ‘fracking’ and its effect on the quality of water in private wells in Texas. The studies have made full use of Shimadzu instruments, such as GC-MS and ICP-OES for chemical and metal speciation in water samples. “We are quite excited about our most recent acquisition of GCMS-TQ8030 technology,” says Schug. “This will be used to determine the byproducts of disinfection and other environmental contaminants in water.” The Shimadzu Center is also a hub for student education. Schug explains how his students are highly trained users on many of the instruments in the Center. “Their experience of working on research projects enables them to train other researchers,” he adds. Schug is also participating in the development of new inquiry-based laboratory experiments for introductory chemistry courses at UT Arlington. Notably, of the US$18.5M allocated for acquisition of instrumentation for the Shimadzu Institute for Research Technologies, which was formally established in February 2013 and includes the SCAAC, approximately US$3M was earmarked for instrumentation for undergraduate teaching. The accessibility of instrumentation at SCAAC within a research environment provides an unprecedented opportunity for students at UT Arlington to contribute to research and development. As Schug stresses, there are few other places in the world where first-year undergraduate students are exposed to state-of-the-art GC-MS, LC-MS, and other spectroscopy instrumentation as part of their science laboratory coursework. “The collaboration between Shimadzu and UT Arlington is a truly unique partnership, and it is exciting to play a central role in directing much of this activity.”

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