Agilent in Liquid Chromatography

OVERVIEW

Chromatography is a technique for separating mixtures into their individual components so that they can be identified and measured. In liquid chromatography (LC), a moving liquid (the mobile phase) carries the sample across a stationary phase (the solid support found within a LC column). The sample components separate based on their differing affinity with the stationary phase. LC is suited for analyzing nonvolatile and thermally fragile molecules including such high molecular weight compounds as proteins. In addition, it can be useful tool for purifying both small molecules as well as macromolecules derived from chemical synthesis or natural processes.

Every liquid chromatograph usually includes the following key components: a pump system for solvent delivery, a sample injector, a column or columns, detectors, and a data handling system. Different types of pumps, injectors, columns, detectors and fraction collectors are used together in various configurations, based on the needs of the sample and application.

Two of the most important subsegments of the LC market are high performance liquid chromatography (HPLC) and liquid chromatography/mass spectrometry (LC/MS). In HPLC, components are dissolved in a solvent, and then delivered through a chromatographic column to a detector under high pressure. HPLC is an easy-to-learn method that can rapidly analyze a wide range of complex mixtures. LC/MS combines the capability of HPLC with mass spectrometry (MS). A mass spectrometer measures the molecular weight of a compound to provide data for both quantitation and qualitative identification. It usually provides greater sensitivity and far more specificity than most other LC detectors.

Agilent Technologies is one of the world's leading suppliers of HPLC and LC/MS systems. Agilent offers complete HPLC solutions with the new 1200 Series, based on the best-selling 1100 Series HPLC system (with over 60,000 systems and 400,000 modules sold worldwide). The 1200 Series is an integrated, reverse-compatible, scalable, and modular platform that provides high accuracy, excellent precision, and unmatched ruggedness and reliability. A comprehensive set of available modules and columns provide customers the flexibility to handle the widest range of LC analyses and purification tasks. The Rapid Resolution High Throughput configuration is the world's fastest, most sensitive HPLC.

Liquid chromatography is a vital tool in the heavily regulated pharmaceutical industry, so Agilent designs its LC and LC/MS systems with many built-in features to facilitate regulatory compliance. Agilent also offers a complete line of compliance services and products, enabling customers to meet regulatory standards while reducing cost of ownership.

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MARKETS

The versatility of liquid chromatography has made it a standard installation in most chemical and life science industries. Agilent's LC and LC/MS systems serve a diverse group of customers, in such markets as pharmaceutical development and manufacturing, proteomics, food safety, environmental, homeland security, and hydrogen processing. Despite being invented a century ago, liquid chromatography continues to enjoy robust demand as new applications and improvements are developed. Particular areas of growth are in the pharmaceutical and life sciences markets, and in rapidly industrializing countries such as China and India.

Pharmaceutical: The pharmaceutical industry is a major user of Agilent LC and LC/MS systems. Liquid chromatography plays an important role in the entire life cycle of a drug, from drug discovery to development to manufacturing and QA/QC. It enables scientists to quickly screen, purify and qualify lead compounds. LC and LC/MS are also the primary tools used to check drug compound quality and quantity with fixed methods in a routine environment to support drug manufacturing.

Proteomics: A growing opportunity for LC and LC/MS is in the identification, isolation and purification of proteins in a cell or body fluid. The versatility of LC makes it an ideal technique to analyze proteins and other biomolecules, which can be large, very sensitive and difficult to analyze.

Environmental: Agilent's customers are primarily government, industrial and independent labs that are focused on regulatory compliance and enforcement. Specific HPLC and LC/MS analyses include novolatile pesticides, herbicides, polynuclear aromatic hydrocarbons and other compounds not suitable for gas chromatography.

Food safety: Food safety testing includes the analysis of additives, residues, contaminates and toxins in agricultural products and foods with a primary focus on regulatory compliance and enforcement. The need for food testing is growing rapidly, driven by the liberalization of global trade, a growing regulatory environment and increased public awareness of food safety issues.

Homeland Security: Agilent has a long history of working with U.S. and international government, military, law enforcement, and health agencies in detecting, identifying, confirming and disarming biological and chemical warfare agents, and toxic industrial compounds.

Hydrocarbon Processing Industries (HPI): Specific LC applications include additive assays, fine and specialty chemical analysis, and characterization of polymers using size exclusion chromatography either with organic or aqueous solvents.

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MAJOR PRODUCTS

1200 Series HPLC and LC/MS systems—Based on the best-selling HPLC platform, the 1200 Series sets the industry standard for performance, ease of use, scalability and reliability. With a large selection of modules available, the 1200 Series HPLC can be optimized for many different functions including capillary LC, nanoflow proteomics and purification. A choice of MS detectors enables ultra-sensitive analytical work.

Nanoflow Proteomics Solution—Agilent combines its experience and leadership in HPLC and MS to create a highly integrated solution to the identification and characterization of enzymatically digested proteins. The solution combines outstanding nanoflow HPLC and MS technology with powerful software and application-specific columns to achieve an unprecedented combination of sensitivity, reliability and automation.

Columns—Agilent offers a large assortment of long-lasting, high-quality columns for a wide variety of applications. Agilent ZORBAX columns provide high quality, highly reproducible results from run to run. For biological analyses, Agilent provides several types of silica based ZORBAX HPLC columns for protein and peptide separations and separations of double stranded DNA as well as single stranded oligo-nucleotides.

Multiple Affinity Removal System— Agilent has developed the first product that enables the simultaneous removal of seven high-abundance proteins from human blood serum. By using immunoaffinity technology to specifically target and remove these proteins, this LC column allows researchers to identify more rare proteins that could serve as drug targets or biological markers in the detection of disease.

Application notes are available at Agilent's online library at:
www.chem.agilent.com/Scripts/Library.asp

HISTORY

Prior to 1999, Agilent Technologies was part of Hewlett-Packard (HP). In 1999, HP announced a strategic realignment to create an independent measurement company composed of its test and measurement, chemical analysis and medical businesses; and a computing and imaging company that includes all of HP's computing, printing and imaging businesses. The measurement company is named Agilent Technologies. Agilent becomes a fully independent company in June 2000, following HP's distribution of its Agilent shares to HP shareholders.

1965 HP enters the analytical instrumentation field with the acquisition of F&M Scientific Corporation of Avondale, Pennsylvania. The acquisition allows HP to further expand its measuring and testing expertise into the area of chemical analysis.

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1973 HP acquires HPLC manufacturer Hupe and Busch.

1975 HP introduces the industry's first microprocessor-based HPLC platform, the1084.

1983 HP introduces the industry's first HPLC system for microbore applications, the HP 1090.

1988 HP introduces the HPLC 1050, which puts an end to the one-size-fits-all approach of integrated HPLC systems.

1994 HP introduces first version of ChemStation software.

1995 HP introduces the 1100 Series, now the world's most popular HPLC.

1998 HP introduces Cerity NDS.

2000 Agilent introduces first capillary HPLC system with active electronic flow control.

2001 Agilent introduces Cerity Networked Data System for Pharmaceutical QA/QC.

2002 Agilent introduces the Nanoflow Proteomics Solution.

2003 Agilent introduces the Multiple Affinity Removal System

2004 Agilent introduces Cerity 3D

2004 Agilent ships the 50,000th 1100 Series

2004 Agilent introduces Multiple Affinity Removal System for proteins in serum

2004 Agilent Technologies introduces breakthrough HPLC-chip/MS technology to replace traditional liquid chromatography columns

2005 Agilent Technologies introduces industry's first HPLC-chip/MS system for proteomics

2005 Agilent Technologies signs agreement to acquire Scientific Software Inc., leading chromatography software and lab informatics company

2006 Agilent Technologies introduces 1200 Series liquid chromatography system, successor to its market-leading 1100 LC

2006 New Agilent ZORBAX Eclipse Plus HPLC columns deliver industry-leading separation performance for the most challenging basic compounds