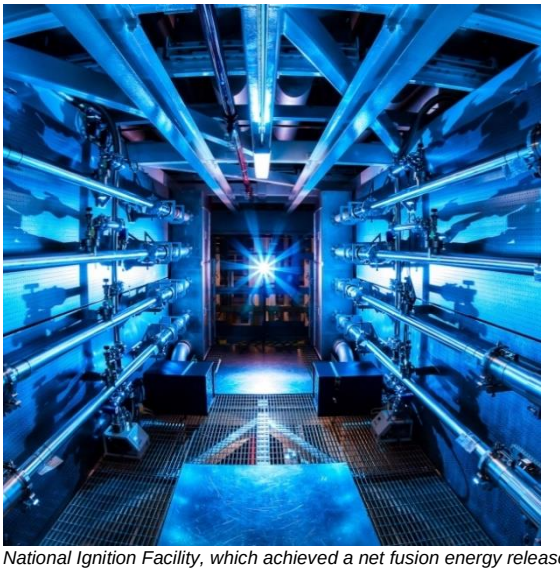
Analytical, Life Science & Diagnostics Association

Industry Market Assessment - Quarterly Review

February 2023

Fourth Quarter (Q4 2022)



National Ignition Facility, which achieved a net fusion energy release in December: LLNL

Prepared by

Strategic Directions International

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Preface

This issue of the ALDA Industry Market Assessment Quarterly (IMAQ) Review prepared by Strategic Directions International, Inc. (SDi) addresses industry results for the fourth quarter of 2022 (October to December). As in the reviews presented in previous years, 15 product categories of particular interest to ALDA are addressed, which generally align with product categories presented in the ***2022 SDi Global Assessment Report***, published June 2022.

The ALDA Board selected SDi to provide industry growth and segmentation data on a quarterly basis as an aid to members for planning and performance measurement purposes based on current industry trends. SDi provides the IMAQ 2 months following the end of each calendar quarter. The next issue covering the first quarter results for 2023 will be published at the end of May. This year-end issue also includes a presentation with additional detail on the life science and cell analysis markets.

SDi has been providing consulting and market intelligence to industry participants for over 40 years. We are well-positioned to assess industry trends based upon our infrastructure for tracking market developments for both our custom research practice and our various publications including the ***SDi Global Assessment Report—The Laboratory Analytical and Life Science Instrumentation Industry***, which covers more than 80 analytical and life science instrument technologies. The 2023 version of the **Global Assessment Report** will publish in April of this year. Recently published titles have covered the market demand from the **Pharma/Bio Industry**, from the **Oil & Gas Industry**, and tools for **Cell & Gene Therapies.** Upcoming report topics include a survey-based report on the **Mass Spectrometry market**, as well as reports on **Process Instrumentation** and demand for instrumentation in the **Food Industry**. SDi also stays on top of industry events with its industry leading newsletter, ***Instrument Business Outlook (IBO)***.

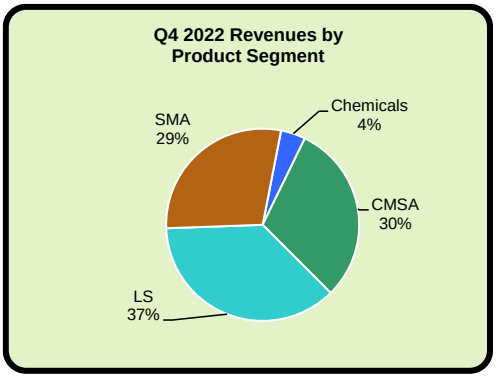
Many of our reports are published for the general industry reader, and in some cases on an annual basis. What differentiates the current report is that it is specifically tailored to meet the needs of the ALDA membership. It is designed to present information on a more frequent quarterly timeframe, at a level of detail that is readily available and useful, and that focuses on the 15 technology markets most important to the membership. The aggregate market of these 15 ALDA segments represents about 75–80% of global industry revenues at end-user values. Of course, many ALDA member companies are involved in a number of technology areas, so multiple presentations are included to show the differences in market growth and regional and industrial prospects for those businesses.

PART B. FOURTH QUARTER MARKET RESULTS

Q4 Revenues by Product Segment

$Mil	2022	2021	Growth
Chrom, Mass Spec & Automation (CMSA)	5,085	4,879	4.2%
Spectroscopy and Materials Analysis (SMA)	4,859	4,598	5.7%
Life Science (LS)	5,870	5,934	-1.1%
Analytical Chemicals	714	668	6.9%
Total	**16,527**	**16,079**	**2.8%**

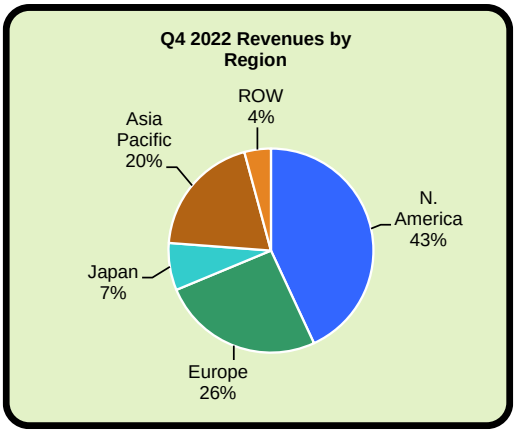
To close out the year, Q4 2022 revenues increased by roughly half a billion dollars, amounting to growth of 2.8% year-over-year. Life science technologies actually experienced a slight decline, due in part to slackening pandemic-related research activities, and weaker systems sales for sequencing, flow cytometry and other technologies. Life science reagents and consumables performed reasonably well. The other technology groupings all experienced mid single digit growth in the quarter, led by analytical chemicals. Like life science reagents, chemicals and consumables spending was strong as lab throughputs increased usage. Chromatography and spectroscopy benefitted from broad strength in academic, environmental and industrial end-markets.



Q4 Revenues by Region

$Mil	2022	2021	Growth
N. America	7,124	6,751	5.5%
Europe	4,232	4,256	-0.6%
Japan	1,238	1,338	-7.5%
Asia Pacific	3,242	3,066	5.8%
ROW	691	668	3.5%
Total	**16,527**	**16,079**	**2.8%**

Currency effects headwinds in the fourth quarter amounted to approximately -6%, masking high single digit organic growth in local currencies for the globe as a whole. Europe and Japan were the most drastically affected, with reported sales in these regions declining in Q4. Despite some disruption in China following the abandonment of the zero-COVID policy, Asia-Pacific demand saw the greatest growth in the quarter, slightly edging out North America for that distinction.

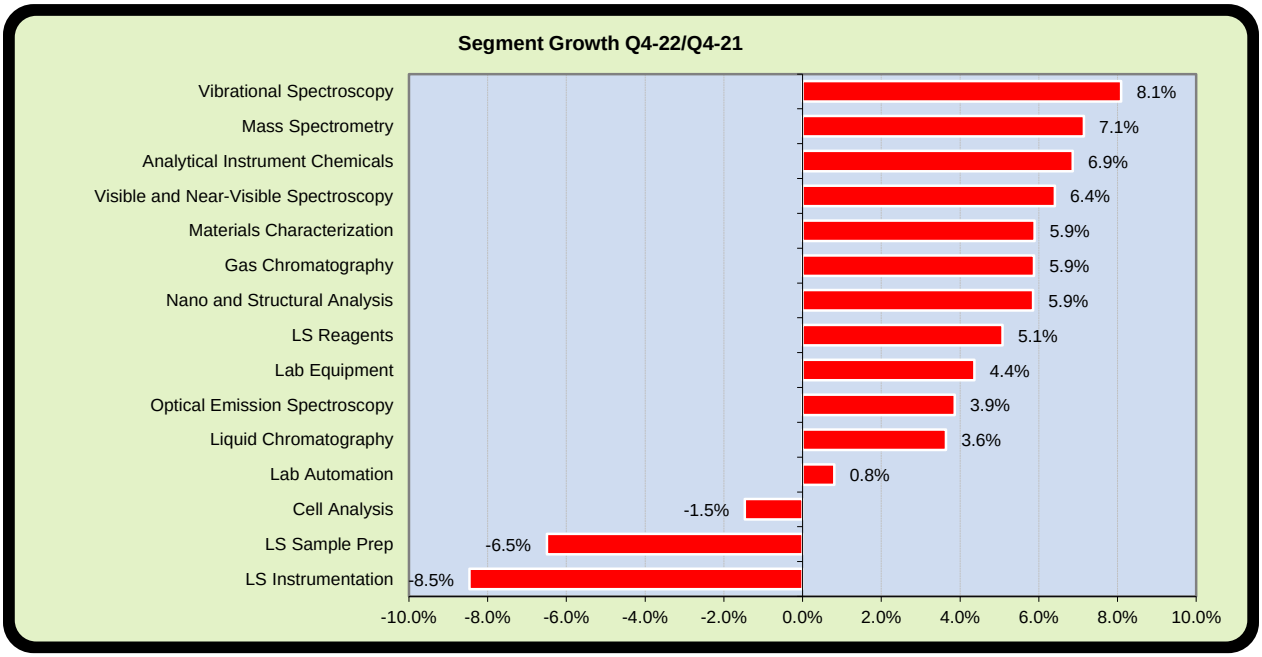


The market defined by ALDA consists of about 50 technology segments and accounts for 75–80% of the worldwide revenues for analytical and life science instrumentation. There are about twenty-five technology segments not included in the ALDA IMAQ Review such as surface science techniques (e.g., optical microscopes), informatics (e.g., LIMS, bio/cheminformatics), separation techniques (e.g., flash chromatography, TLC, CE), physical testing, elemental analyzers, and several other technologies.

1. Q4 2022 Revenues by Product

Q4 Revenues by Product

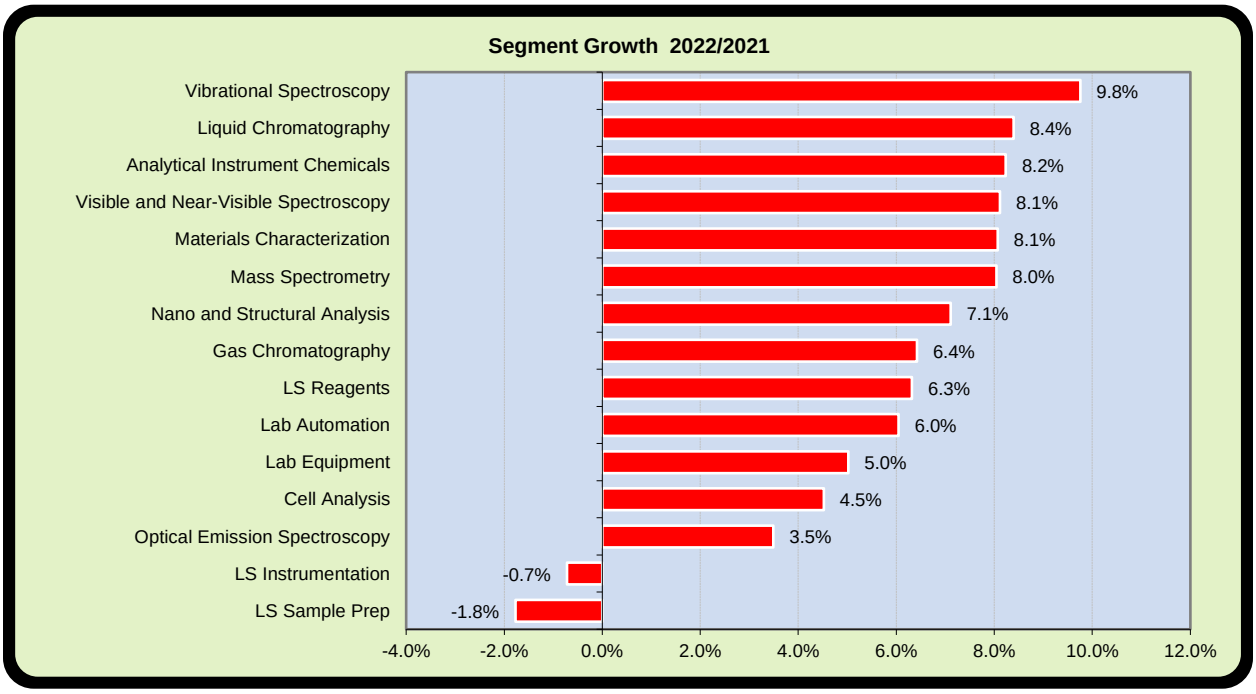
$Mil	2022	2021	Growth
Spectroscopy and Materials Analysis	**4,859**	**4,598**	**5.7%**
Laboratory Equipment	1,020	977	4.4%
Materials Characterization	684	646	5.9%
Nano and Structural Analysis	1,588	1,500	5.9%
Optical Emission Spectroscopy	407	391	3.9%
Vibrational Spectroscopy	560	518	8.1%
Visible and Near-Visible Spectroscopy	601	564	6.4%
Chrom, Mass Spec & Automation	**5,085**	**4,879**	**4.2%**
Gas Chromatography	788	744	5.9%
Laboratory Automation	1,195	1,186	0.8%
Liquid Chromatography	1,745	1,684	3.6%
Mass Spectrometry	1,357	1,266	7.1%
Life Science	**5,870**	**5,934**	**-1.1%**
Cell Analysis	485	492	-1.5%
Life Science Instrumentation	1,256	1,372	-8.5%
Life Science Reagents	2,934	2,792	5.1%
Life Science Sample Prep	1,195	1,278	-6.5%
Analytical Chemicals	**714**	**668**	**6.9%**
Total	**16,527**	**16,079**	**2.8%**



2. 2022 Revenues by Product

Twelve Months Revenues by Product

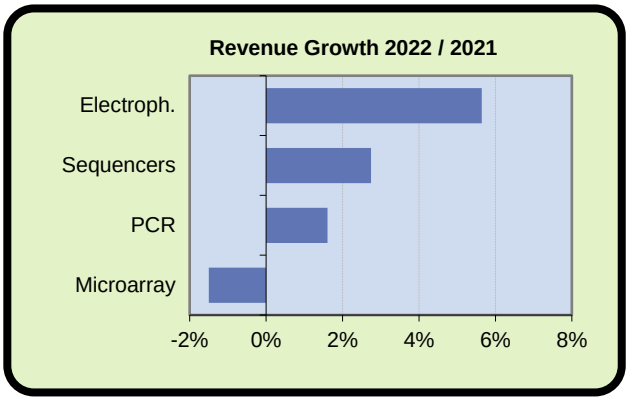
$Mil	2022	2021	Growth
Spectroscopy and Materials Analysis	**17,890**	**16,727**	**7.0%**
Laboratory Equipment	3,478	3,312	5.0%
Materials Characterization	2,576	2,383	8.1%
Nano and Structural Analysis	6,229	5,816	7.1%
Optical Emission Spectroscopy	1,414	1,367	3.5%
Vibrational Spectroscopy	2,093	1,907	9.8%
Visible and Near-Visible Spectroscopy	2,101	1,943	8.1%
Chrom, Mass Spec & Automation	**19,317**	**17,979**	**7.4%**
Gas Chromatography	3,168	2,977	6.4%
Laboratory Automation	4,366	4,117	6.0%
Liquid Chromatography	6,652	6,137	8.4%
Mass Spectrometry	5,130	4,748	8.0%
Life Science	**22,231**	**21,652**	**2.7%**
Cell Analysis	1,753	1,677	4.5%
Life Science Instrumentation	4,789	4,824	-0.7%
Life Science Reagents	10,591	9,961	6.3%
Life Science Sample Prep	5,097	5,190	-1.8%
Analytical Chemicals	**2,776**	**2,565**	**8.2%**
Total	**62,214**	**58,922**	**5.6%**



3. Life Science & Cell Analysis Review 2022

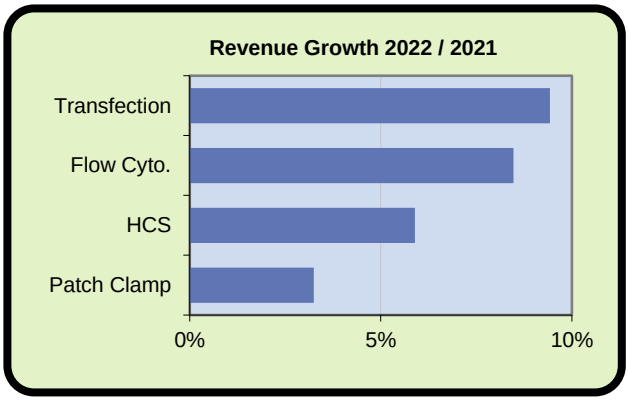
Life Science Instrumentation Market Size

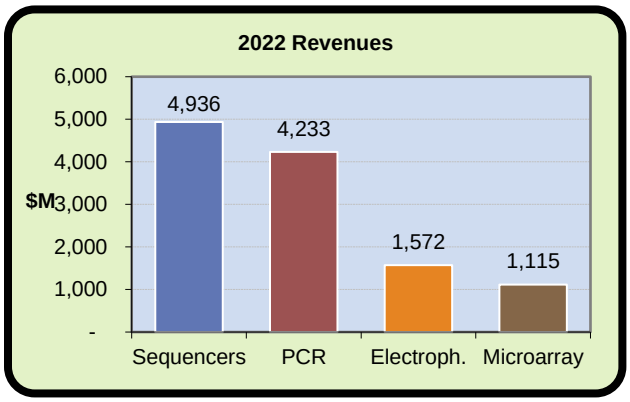
With reagents and chemicals folded back into the product mix, total demand for the life science instrumentation categories reached $11.9 billion in 2022. Sequencing faced a difficult fourth quarter of 2022, in part due to the future expectation of new systems reaching the market. However, for the year, sequencing demand nearly reached $5 billion. PCR is the second largest individual market, followed distantly by electrophoresis and microarrays.



Cell Analysis Market Size

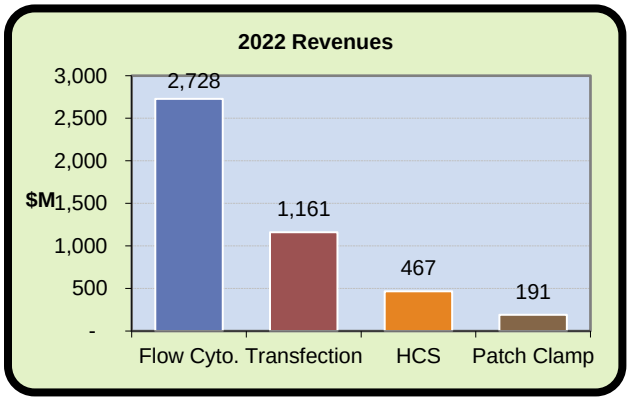
Including systems, aftermarket, and service, total revenues for the four cell analysis technologies totalled more than $4.5 billion. A majority of that amount stems from flow cytometry alone. Transfection techniques continue to energize life science research and cell-related therapies in particular, with annual revenues of more than $1 billion. High content screening/analysis and patch clamp techniques represent 10% and 4% of the market, respectively.





Life Science Instrumentation Market Growth

Tough comparisons and weakening COIVD-related demand held back 2022 growth for sequencing and PCR, so that they advanced only in the low single digits. Microarray technology is facing more significant difficulties due to competition from other techniques and slackening demand from direct-to-consumer testing, leading to a year over year decline. Electrophoresis achieved the strongest growth in 2022.



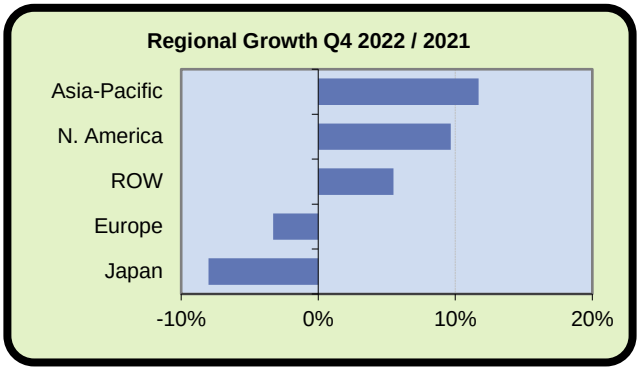
Cell Analysis Market Growth

All four techniques achieved positive growth in 2022. Transfection has been the general growth leader over the past several years, as it has transitioned out of academic settings and into the mainstream biopharma toolbox. Overall, growth in these cell analysis techniques was slower in 2022 than in 2021, but has been better sustained than for the more genetics-oriented life science instrumentation group of technologies.

PART B. LAB EQUIPMENT

Overview

The lab equipment market is comprised of a group of relatively low-cost instruments including: centrifuges, electrochemistry products, and laboratory balances. The market includes initial systems sales, aftermarket purchases and service. In the fourth quarter of 2022, lab equipment demand experienced year-over-year growth of 4.4%, as well as sequential growth compared to the previous quarter.

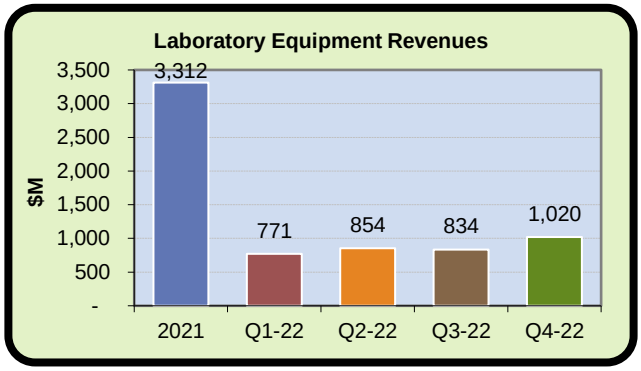


Product Segmentation

Initial systems account for the majority of the lab equipment market. This is inflated by readily available lower end models, whose relatively low cost leads to high turnover, as most labs replace rather than repair their equipment. This also reduces the service revenue generated by the market. Conversely, more specialized, higher-end lab equipment may require regular calibration for optimal operation. Components, such as changeable rotors for centrifuges, make up 10% of the market.

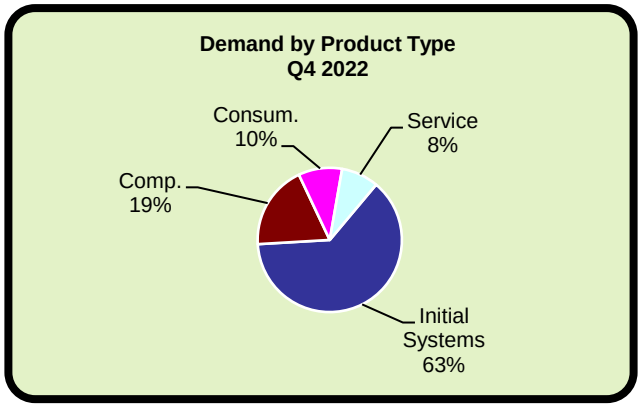
Market Developments

In November, HORIBA Advanced Techno introduced the world's first gel-filled, self-cleaning pH electrode using antifoul technology. It is designed for use by sewage and wastewater treatment plants that utilize activated sludge for their water cleaning processes.



Regional Demand

Negative currency effects reduced the revenues generated by demand for lab equipment in nearly all regions, with Japan experiencing the strongest effects. Demand in China continued to be affected by the country's zero COVID policy, until the strategy was suddenly halted in December; the resulting surge in infections further disrupted demand. However, China's funding for new labs increased during the quarter, partially offsetting these COVID effects.



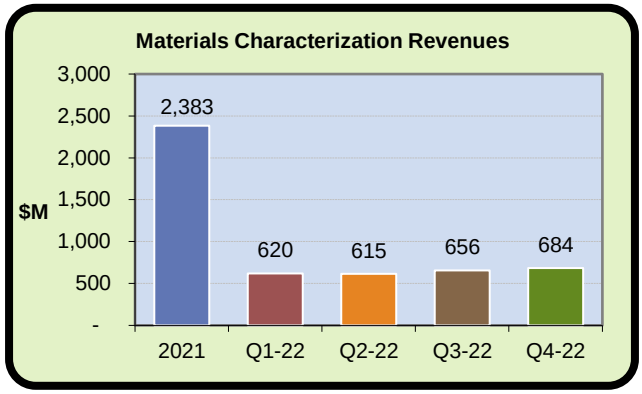
Near Term Prospects

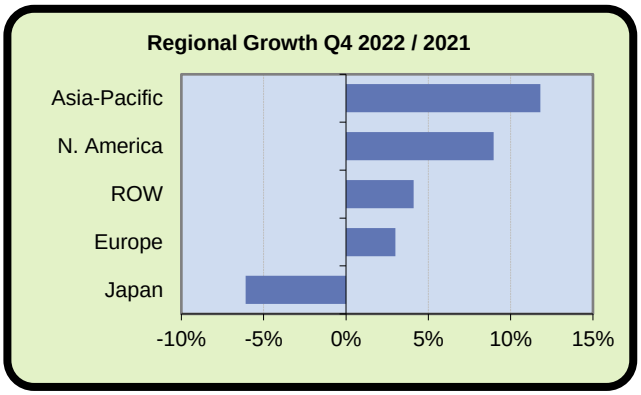
Following the challenges of the pandemic lockdowns, demand in China is expected to rebound strongly in 2023. However, many vendors are still experiencing supply chain difficulties, impacting their ability to deliver instruments. Several vendors have indicated that they plan to implement price increases in early 2023.

PART C. MATERIALS CHARACTERIZATION

Overview

The materials characterization market comprises thermal analysis, calorimetry, particle characterization (including particle counters), and viscometry/rheometry. Revenue estimates encompass initial systems, components, consumables, and service, but exclude small amounts of life science reagents and analytical chemicals. During the fourth quarter of 2022, demand grew by 5.9% year over year.



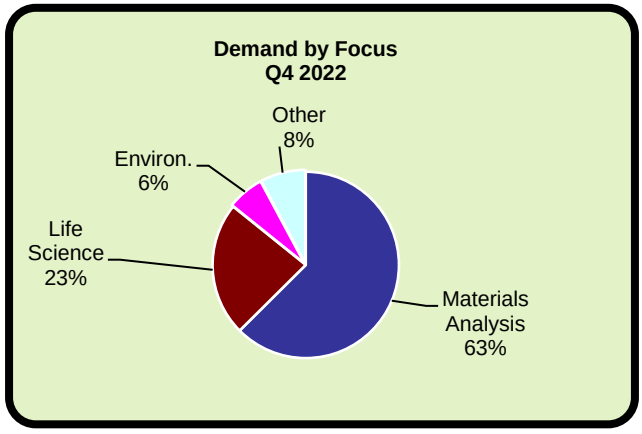


Regional Demand

Asia-Pacific maintained strong growth in the quarter, driven by semiconductor industry demand. Growth was partially hampered by slowdowns in China, where COVID resurgence hampered local demand. Demand in North America and Europe was similarly driven by battery, semiconductor, and environmental research. Japan continued to struggle with poor currency conditions and difficult supply chains.

End-User Markets

Materials Analysis is the primary focus for the instruments covered in this section. Measuring characteristics of solid and particulate matter is necessary for categorizing and grading the properties and quality of various materials and products. An example this quarter is in particle characterization, where battery materials research is driving demand. Life science is the second largest focus, and comprises various applications in pharmaceutical testing.



Market Developments

Waters acquired Wyatt technology, which is a market leader in light scattering instruments. In addition, Wyatt is also a vendor of refractometers and viscometers. The $1.36 billion deal is expected to close in the second quarter of 2023. Anton Paar announced two new subsidiaries in The Netherlands and in the Philippines on the heels of record revenues for 2022.

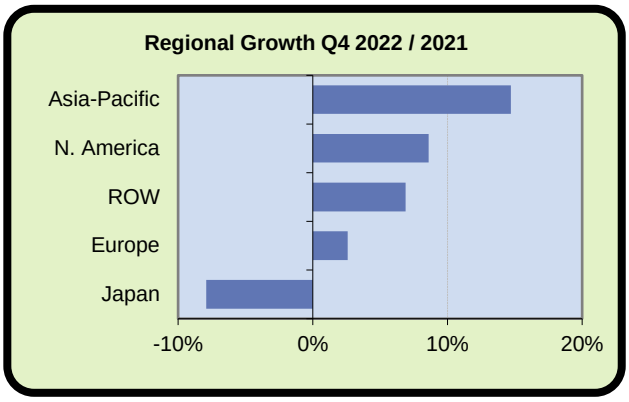
Near Term Prospects

Materials characterization growth is expected to be in the mid-single digits in the first quarter of 2023, with growth rates slowing down as the year progress. Growth will continue to be strong for semiconductor and pharmaceutical applications. Conditions in China are expected to slowly improve, but may not fully resolve by the end of the quarter.

PART D. NANO AND STRUCTURAL ANALYSIS

Overview

The nano and structural analysis market is composed of four segments: nuclear magnetic resonance (NMR), electron microscopy, X-ray diffraction (XRD) and X-ray fluorescence (XRF). Revenue estimates include initial systems, components, consumables, and service, but exclude small amounts of life science reagents and analytical chemicals, which are considered elsewhere. Fourth quarter revenues advanced 5.9% over 2021, driven by electron microscopy.

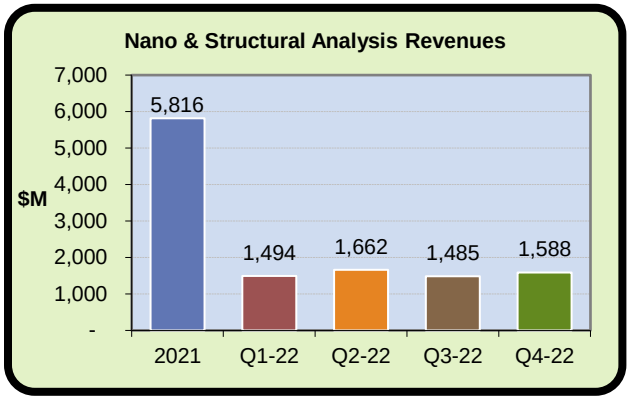


End-User Markets

These instruments are used across a variety of functional categories. By a small margin quality control is the largest segment. One major application is compliance with hazardous substance regulations for electronics and other consumer products. XRF is the primary tool for these applications. Semiconductors and electronics make up a significant customer base across XRF, XRD and electron microscopy, but with broader functional applications from basic research through applied R&D and quality testing.

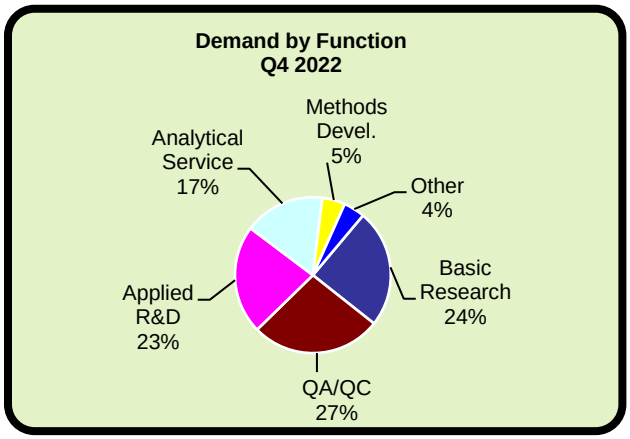
Market Developments

In October, Rigaku released its new XSPA-400 ER detector to the global market following its domestic launch at JASIS the previous month. The XSPA-400 ER is a pixel multi-dimensional detector for XRD suited for battery, steel and ceramic analyses. In November, Korea IT News reported that ZEISS is building a semiconductor and microscopy R&D facility in South Korea, its first outside Germany.



Regional Demand

Although China faced some difficulties in Q4 due to COVID, growth was still strong for these products, helping to push Asia-Pacific into double-digit growth. South Korea and Taiwan saw strong uptake of XRF and electron microscopy systems supporting the electronics industry. Academic customers in Asia helped the general growth trend. North America had a strong showing in the quarter, driven by both high-end academic research and industrial spending. Currency effects retarded growth in Europe and Japan.



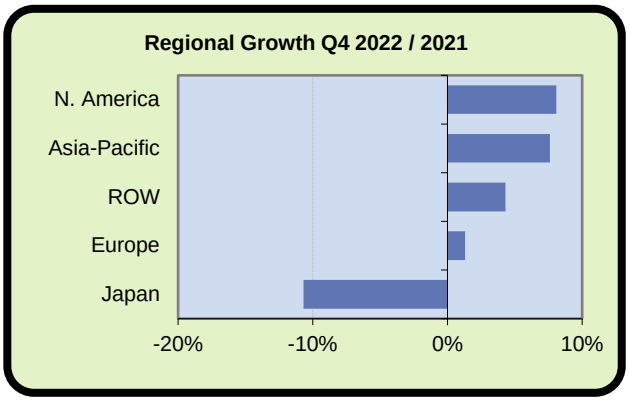
Near Term Prospects

Industrial markets slowed somewhat in the last quarter of the year, and some weakness in these customers can be expected through the first half of 2023. Fortunately, improved public sector spending has helped to support growth for these techniques. By the second half of 2023, we expect growth to accelerate more uniformly, compared to a rockier first half.

PART E. OPTICAL EMISSION SPECTROSCOPY

Overview

The optical emission spectroscopy market comprises atomic absorbance (AA), inductively coupled plasma (ICP) and arc/spark optical emission spectroscopy. Revenue estimates encompass initial systems, components, consumables, and service, but exclude analytical chemicals, which are considered elsewhere. In the fourth quarter, demand grew 3.9% year over year, slightly faster than the annual growth rate of 3.5%, driven by environmental testing.

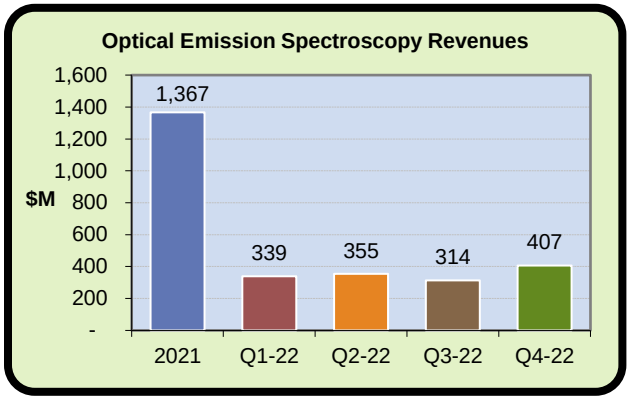


End-User Markets

Environmental testing is the central focus of nearly half of the demand for these products, centering primarily on AA and ICP, which are routinely used for testing water and other environmental samples. In Q4, environmental applications saw strong worldwide demand. Materials analysis formed the second largest segment. These applications favor arc/spark OES, which has significant usage in the metals industry. However, in Q4, the strongest growth in demand for arc/spark derived from oil & gas applications.

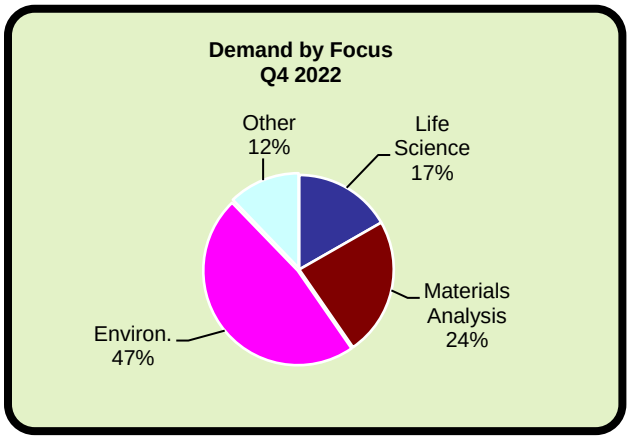
Market Developments

Shimadzu introduced its new AA-7800 Series atomic absorption spectrophotometers. Autosampler specialist HTA announced the HT1200I ICP autosampler featuring support for closed sample tubes, improving air quality in the lab. Alpha Resources announced the expansion of its Thermo Fisher Scientific-compatible products to includes supplies for OES.



Regional Demand

North America and Asia Pacific customers had strong budgetary spend to close out the year. Both regions had brisk environmental sales, while the North American academic market showed renewed strength, helping to push North America into the top position in terms of growth. Europe and Japan were both again subject to significant negative foreign exchange headwinds. These effects effectively cancelled European growth, and overpowered relatively strong organic demand in Japan for a negative reported growth result.



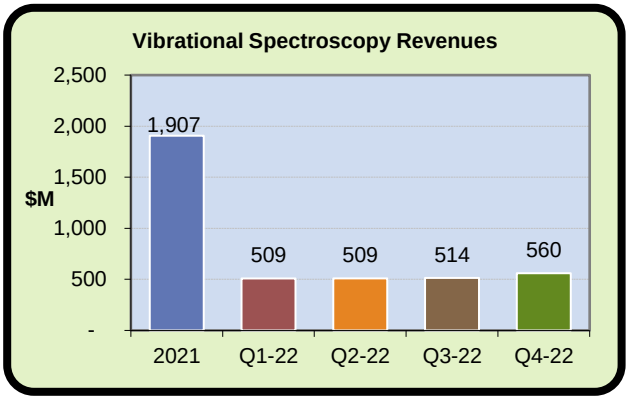
Near Term Prospects

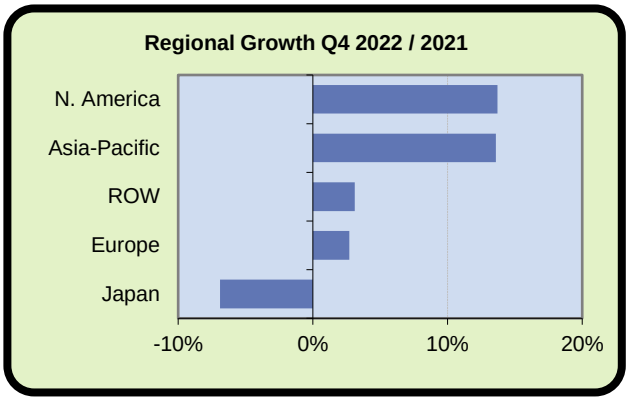
Environmental concerns continue to drive most demand for these products. While overall growth remains slow, it should accelerate as 2023 progresses.

PART F. VIBRATIONAL SPECTROSCOPY

Overview

The vibrational spectroscopy market comprises infrared, near-infrared (NIR), and Raman spectroscopy, including both conventional and Fourier transform (FT) methods. Revenue estimates encompass initial systems, components, consumables, and service, but exclude analytical chemicals, considered elsewhere. Biotech and food safety testing sales drove growth in Q4, amounting to an increase of 8.1%.



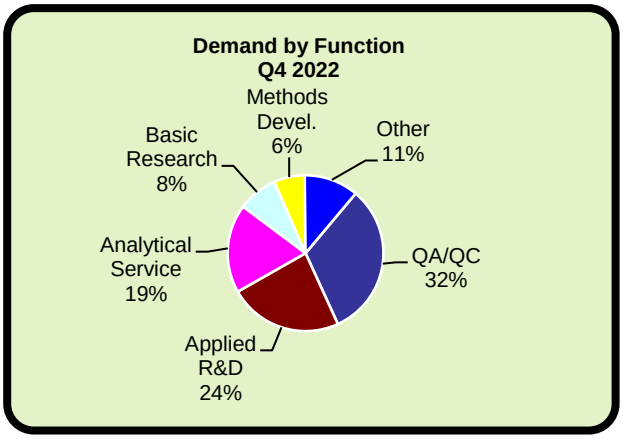


Regional Demand

North America led the regional growth with broad based growth across all the end markets. A spike in COVID-19 infections caused by the recent pivot of China's zero COVID policy hampered growth for the quarter. Elsewehere in APAC, environmental and food safety testing demand was strong. Japan's economic growth after a contraction in Q3 was offset by currency headwinds. Despite energy and inflation crises, European market demand remained stable.

End-User Markets

The return of normal levels of academic spending resulted in significant growth for basic research applications. QA/QC is the leading functional demand driven by the use of these tools by pharma/bio customers. Analytical services, especially in APAC markets, grew strongly during the quarter. The growth was driven by the use of FT-IR in environmental and food testing labs. The broad-based applications of the technology drives growth for the Applied R&D segment across many industries.



Market Developments

Ocean Insight, an applied spectral knowledge company, launched in October the Ocean HR2 spectrometer, a high-resolution, configurable spectrometer for applications ranging from plasma monitoring to pharmaceutical analysis. In November, RedWave introduced the ProtectIR, an advanced FT-IR emergency response tool for the identification of unknown solid or liquid materials.

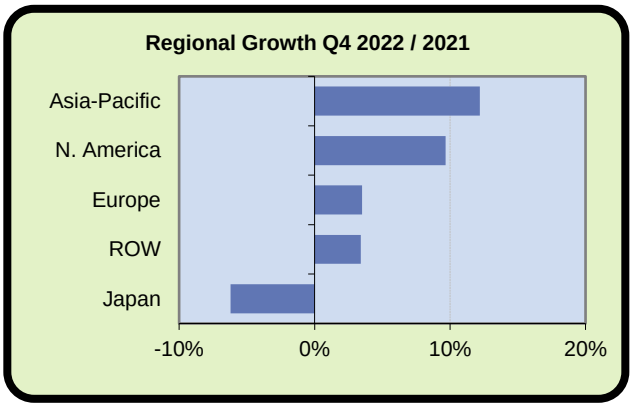
Near Term Prospects:

The reversal of the Zero-COVID policy provides economic growth opportunities for China in 2023. Residual COVID-related revenues are expected to decline worldwide. Demand from food testing will support growing APAC markets and government incentives will boost pharma/bio growth in the US. The Japanese yen looks to be set for improvement in value, helping to return demand toa growth trajectory.

PART G. VISIBLE AND NEAR VISIBLE METHODS

Overview

The visible and near-visible methods market comprises UV/Visible spectroscopy, fluorescence, color measurement, ellipsometry, polarimetry, and refractometry. Revenue estimates include initial systems, components, consumables, and service, but exclude life science reagents and analytical chemicals, considered elsewhere. Visible and near visible methods achieved 6.4% year over year growth in Q4 2022, led by UV-Vis Spectroscopy.

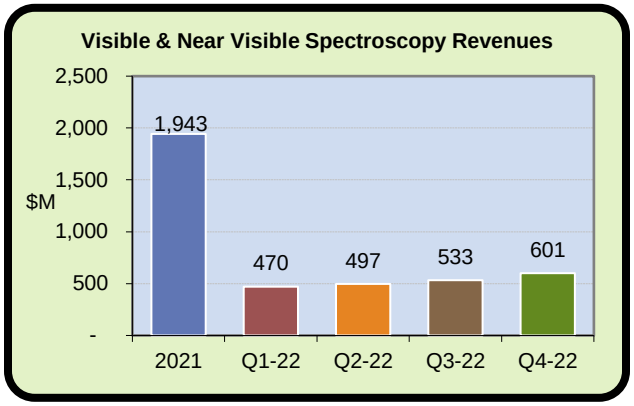


End-User Markets

Visible and near-visible technologies saw the most demand by function from QA/QC, driven by the pharma/bio industry in particular. Applied R&D was the growth leader, driven by increased government spending relating to the pharma/bio sector, especially in the US. Growth for analytical service was particularly strong in environmental and food testing laboratories in the APAC markets. Environmental testing was also strong for these products globally.

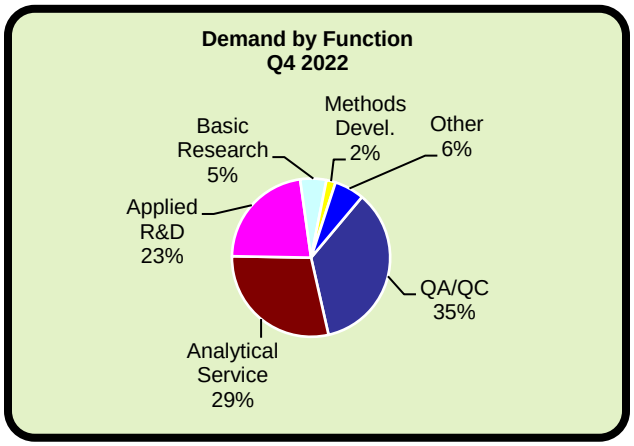
Market Developments

In December, X-Rite and Pantone, color science and technology businesses, launched the Ci7830 and Ci7630 reflectance benchtop spectrophotometers ideal for textiles, paint and coatings, plastics, building materials and home goods. The respective high and mid-range instruments will be used to color control across the supply chain.



Regional Demand

APAC led the regional growth, driven by strong demand from environmental and food safety testing. Pharma/Bio continued to provide support for North American growth. Chinese demand declined following a spike in COVID-19 infections after the reversal of its Zero Covid policy. Japan experienced organic growth; however, this was offset by strong currency headwinds. Growth was modest in Europe and ROW.



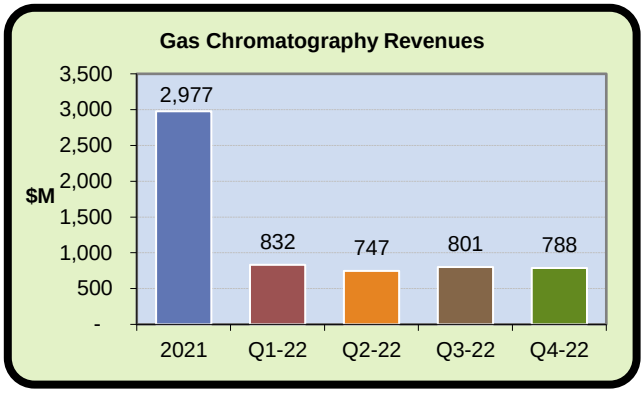
Near Term Prospects

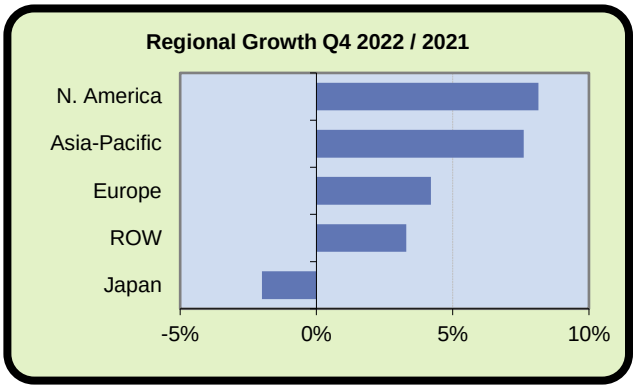
The pivot from zero COVID policy will boost economic growth in 2023 for China. Water quality and other environmental concerns will continue to drive growth for these technologies, particularly in the developing world.

PART H. GAS CHROMATOGRAPHY

Overview

The gas chromatography market comprises not just the chromatographs, but also associated detectors, including mass spectrometry (GC-MS). Revenue estimates encompass initial systems, components, consumables, and service, but exclude analytical chemicals, considered elsewhere. Market demand grew by 5.9% in the fourth quarter of 2022 compared to last year, driven by increased demand in chemicals, energy, and pharma/biotech applications.



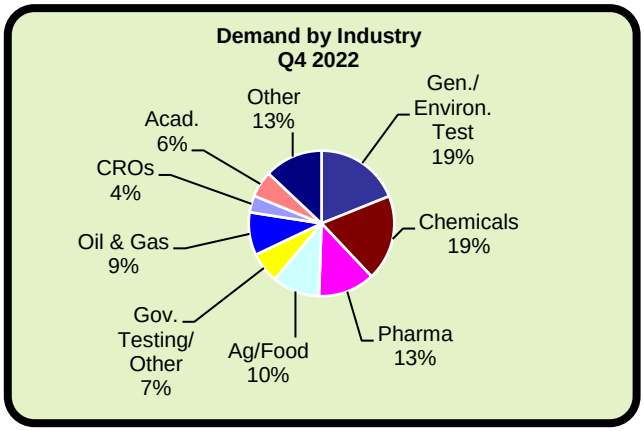


Regional Demand

North America led regional growth driven by industrial customers and environmental testing. Asia-Pacific, led by India, experienced similar growth, bolstered by chemical and food testing and a growing pharma/bio industry. Currency headwinds continued to hinder growth in Japan. Europe saw robust organic growth driven by pharma/bio and industrials.

End-User Markets

GC and GC/MS are utilized in a number of industries. Chemicals, energy, and to a lesser extent pharma had a particularly strong quarter. General and environmental testing buoyed growth this quarter sustained by demand in consumables and initial systems as water pollution issues drew attention, particularly in North America. The ag/food industry saw modest gains this quarter, supported by food safety testing in Asia Pacific.



Market Developments

Agilent partnered with Fluid Management Systems (FMS) to create and market workflows for the testing and analysis of organic pollutants and other emerging contaminants in environmental and food matrices. The workflows couple extraction devices from FMS with Agilent's consumables and sample preparation solutions.

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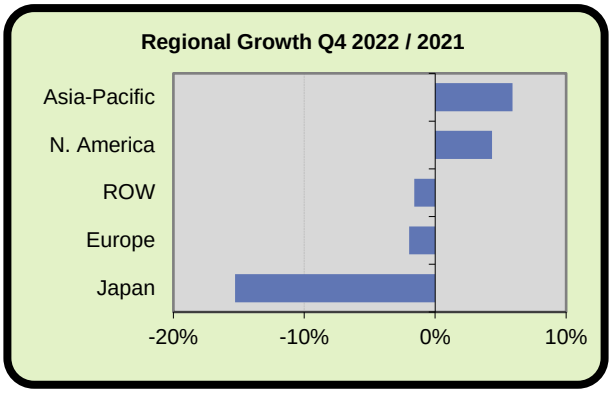
Near Term Prospects

The market is expected to grow mid-single-digit in the first quarter of 2023 driven by environmental, industrial, and pharma/biotech markets. Increased government funding in the US and Asia will also boost growth, particularly for advanced material testing and sustainability focused projects. PFAS testing is poised to increase growth in North America and Europe.

PART I. LAB AUTOMATION

Overview

The lab automation market is composed of liquid handlers, robots, microplate readers, and multiplex/high-throughput ELISA systems. Revenue estimates encompass initial systems, components, consumables, and service, but exclude life science reagents, considered elsewhere. Lab automation demand was mixed. As a result, growth was modest at 0.8% compared to the prior year due to a significant decline in COVID-19-related usage.

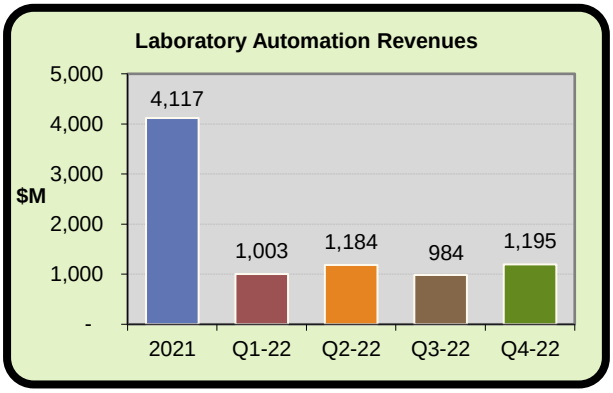


End-User Markets

Automated workstations, liquid handlers, and plate readers are common in applied R&D and service laboratories where budgets are large enough to support capital expenditures. However, lab spending contracted slightly in biotech applications. Pharma spending was stable during the quarter. The remaining functions contracted during the quarter due to a strong quarter in the prior year quarter. Manual liquid handling grew modestly in basic research lab functions.

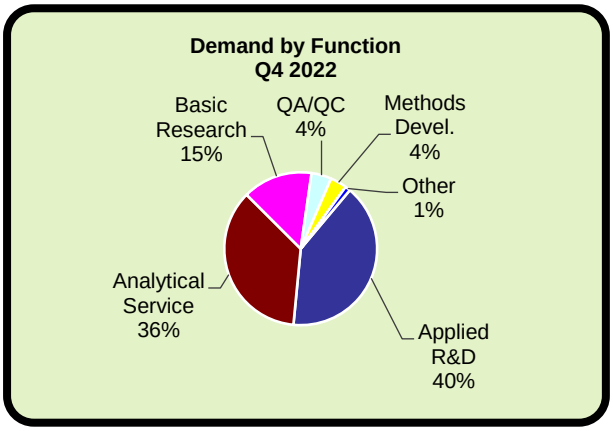
Market Developments

Azenta acquired Ziath, a maker of 2D barcode readers. S2 Genomics, a solid tissue processing automation firm, entered into a distribution agreement with Proteigene in France.



Regional Demand

Asia-Pacific and North America were the fastest growing regions with mid-single digit growth during the quarter. Following reopening, China saw post-COVID tailwinds buoy demand. The rest of the world faced a tough comparison to the previous year due to COVID-19 headwinds and ongoing supply chain challenges that delayed instrument deliveries in most regions. Currency headwinds factored into results this quarter.



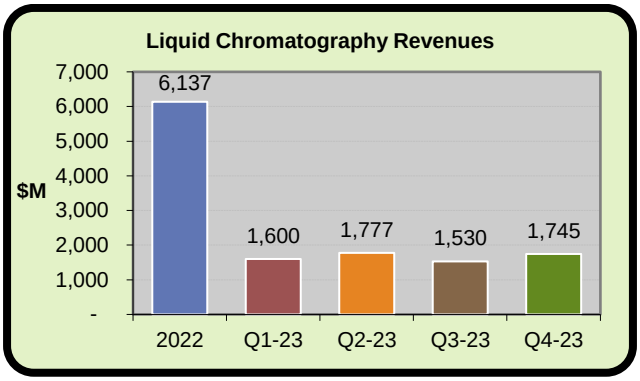
Near Term Prospects

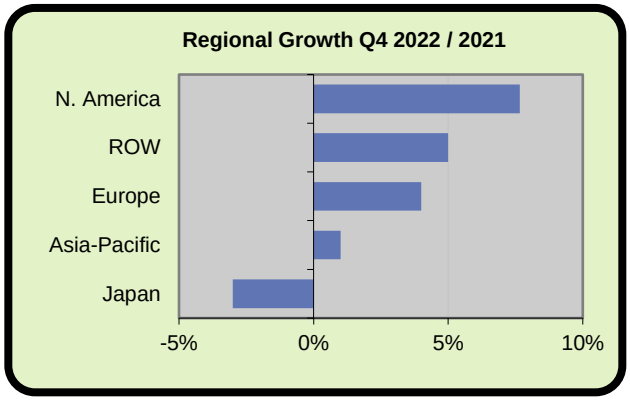
High throughput systems and software will see stronger uptake in the near-term, while lower-end liquid handling will see modest gains. COVID-19 headwinds will likely be less of a factor going forward.

PART J. LIQUID CHROMATOGRAPHY

Overview

The liquid chromatography market comprises HPLC, IC, and LPLC. Revenue estimates encompass initial systems, components, consumables, and service, but exclude analytical chemicals, considered elsewhere. In the fourth quarter of 2022, demand for liquid chromatography grew by 3.6% compared to the same quarter last year due to pharma/bio, applied and industrial applications.



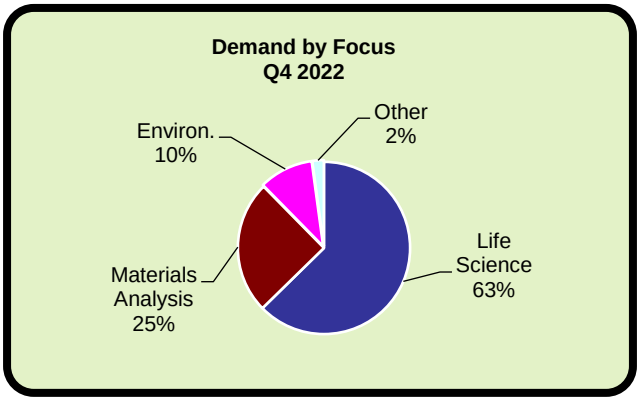


Regional Demand

North America led regional growth, driven by environmental and industrial applications. China's reversal of its zero covid policy resulted in a spike of infections in the region, hampering growth. Other APAC sales were better. Japan posted a strong fourth quarter, despite currency headwinds. The warmer than expected winter enabled Europe to escape an energy crisis, allowing the region to support modest growth despite the conflict in the region and currency effects.

End-User Markets

Life science focused labs saw stagnant growth this quarter. The strong rebound experienced in 2021 made for a difficult comparison, as COVID-19-related revenues decline and the pharma/bio sector pivots. Environmental testing applications grew well, and worldwide regulations on PFAS and other emerging pollutants are increasing demand for IC and HPLC. Materials Analysis remained strong, with significant demand from chemicals, battery applications and sustainable polymers.



Market Developments

Waters announced an agreement to acquire Wyatt Technology, a pioneer in light scattering and field-flow fractionation instruments. The transaction is expected to close in the second quarter of 2023. Thermo Fisher expanded its global biologics and steriles manufacturing capabilities in China. The site will not only address the needs of organizations in China, but also for others located in the Asia-Pacific region.

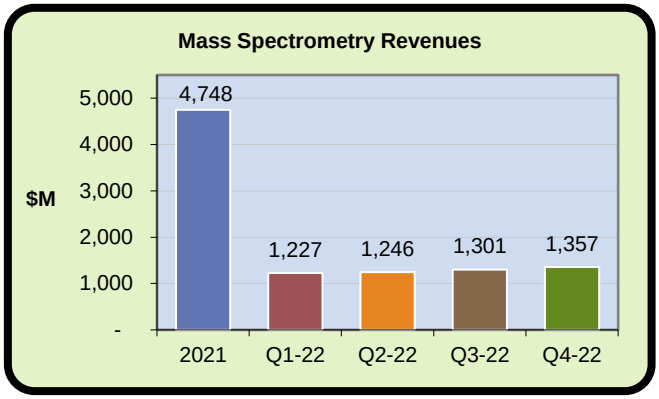
Near Term Prospects

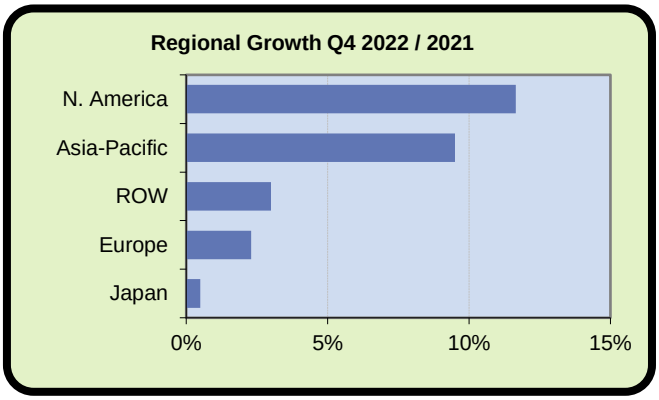
The market is expected to be buoyed by increased government funding in the academic and government sector. Modest growth in the pharma/bio industry is projected, sustained by continued instrument replacements, especially bio-inert systems to support biologic research and development. However, price increases and continued macroeconomic uncertainty will hinder overall growth.

PART K. MASS SPECTROMETRY

Overview

The mass spectrometry market comprises LC-MS, MALDI-TOF, SIMS, ICP-MS, magnetic sector and FT-MS instrumentation. Revenue estimates encompass initial systems, components, consumables, and service, but exclude analytical chemicals, considered elsewhere. Market demand increased by 7.1% in the fourth quarter of 2022 year over year. Demand was strong for TOF LC/MS and tandem LC/MS systems.



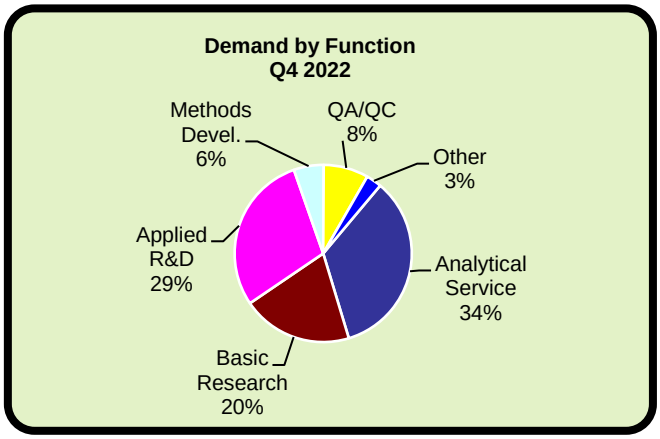


Regional Demand

North America favored TOF and tandem LC/MS systems, driven by proteomics and environmental applications respectively. APAC demand was somewhat hindered by the removal of the zero-COVID policy in China, which led to high infection rates across the country and reduction in production of instruments and overall demand. Japan showed signs of achieved positive growth despite powerful negative currency effects, driven by LC/MS sales in clinical and food inspection.

End-User Markets

Analytical service is a major function for mass spec and saw accelerated growth in the quarter due to higher demand for tandem LC/MS device as a response to EPA approved methods for PFAS testing on triple Quad systems, which are sensitive to low level contaminants and can be run in a high throughput fashion. Basic research has increasingly adopted qTOF instruments for proteome research, where identification studies of rare proteins have become prominent due to innovation in the capabilities of qTOF instruments and associated DIA methods.



Market Developments

Biognosys launched a new version of Spectronaut, with directDIA+ for proteomics. Shimadzu and PACE developed a new alternative test procedure to EPA method 1613B (dioxin determination). Genedata, a biopharma enterprise software provider, launched the Genedata Expressionist 16.5 software that introduces top down protein sequencing using tandem MS.

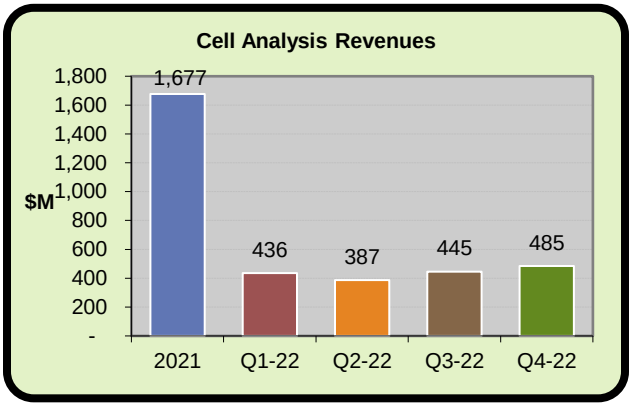
Near Term Prospects

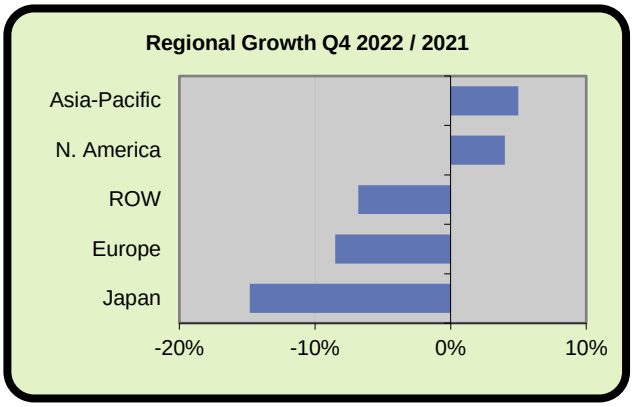
The opening of 2023 will show a gradual slowdown of growth for mass spectrometry overall compared to past quarters, but still in the high single digits. MS growth in China will gradually grow stronger as the effects of the COVID pandemic gradually ease following the recent rapid infection of the country. Currency conditions in Japan and Europe remain a retarding force.

PART L. CELL ANALYSIS

Overview

The cell analysis market comprises flow cytometers, transfection, high content screening, and patch clamp systems. Revenue estimates encompass initial systems, components, consumables, and service, but exclude life science reagents, considered elsewhere. Globally, the market for cell analysis contracted by 1.5% due to declining demand for COVID-19-related products and research.



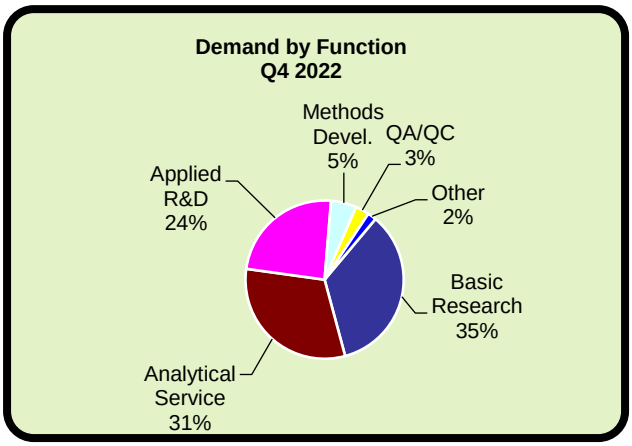


Regional Demand

Most regions experienced declines due to components shortages, delays in instrument deliveries, and receding COVID-19 demand. Despite strong demand for non-COVID research areas, overall, Asia Pacific and North America were the only regions with growth. During the quarter, China abruptly reversed their COVID-19 lockdown policies. Cases surged rapidly in the region, enhancing demand for certain reagents, while also shuttering some labs.

End-User Markets

Flow cytometry and patch clamping systems grew modestly in basic research laboratories. In the remaining lab functions growth was hindered by supply chain disruptions that delayed instrument deliveries. Additionally, declining COVID-19 research offset growth across functions when compared to the fourth quarter of 2021, which made for a strong comparison.



Market Developments

BD introduced BD Research Cloud software for flow cytometry workflows. Fluxion introduced 3 new products including the IonFlux Mercury automated patch clamp system.

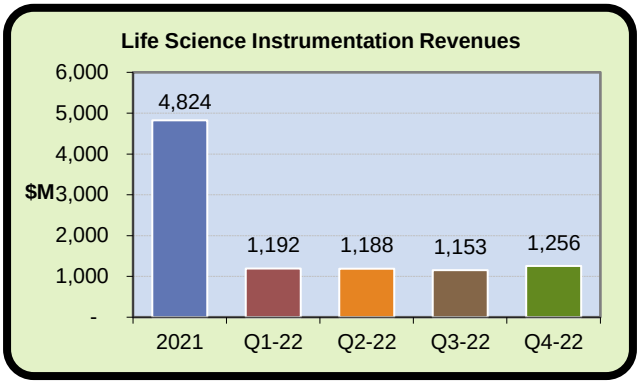
Near Term Prospects

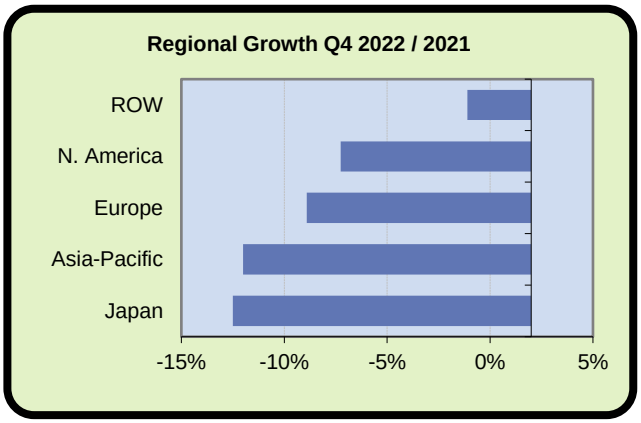
Future demand for cell analysis will be mixed. Flow cytometry applications will maintain strength. Currency effects will likely continue to offset growth regionally, disguising or obliterating organic growth.

PART M. LIFE SCIENCE INSTRUMENTATION

Overview

The life science instrumentation market comprises nucleic acid amplification/PCR, microarrays, sequencers, and electrophoresis hardware. Revenue estimates encompass initial systems, components, consumables, and service, but exclude life science reagents, considered elsewhere. The fourth quarter of 2022 was uncharacteristically difficult for the market, with a decline of 8.5%, as COVID-driven challenges persisted in China and end-users delayed purchases, particularly of sequencing instruments.





End-User Markets

As demand for COVID-related testing and surveillance continues to rapidly decline, so does the share of the market represented by analytical services. In fact, lower demand for COVID-related products caused many vendors to report year-over-year declines despite generally stronger demand for other types of life science instrumentation.

Applied R&D and methods development led growth in Q4, as demand from the pharmaceutical industry remained focused on producing new therapies.

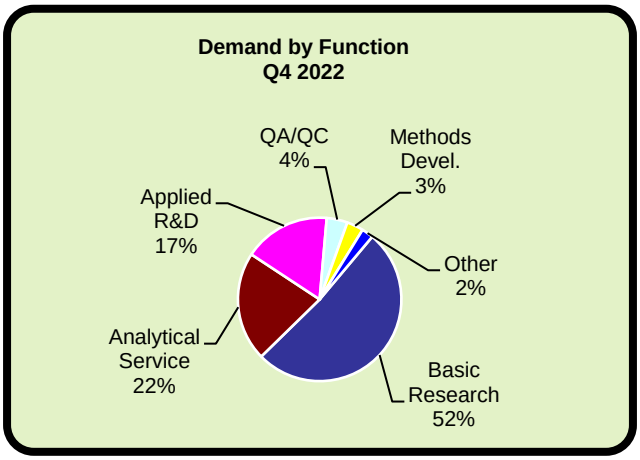
Market Developments

Pacific Biosciences launched two new sequencing platforms in October. The Onso platform is the company's first short-read instrument, utilizing sequencing-by-binding technology. The Revio platform is a long-read system, and the latest instrument using PacBio's SMRT technology.

Regional Demand

Demand in China continued to be impacted by COVID lockdowns for much of the quarter, until the zero COVID policy was suddenly reversed in December, resulting in a surge of infections.

Nearly all regions were affected by negative currency effects, with Japan experiencing the strongest, double-digit headwinds, while Europe also suffered high single-digit negative effects.



Near Term Prospects

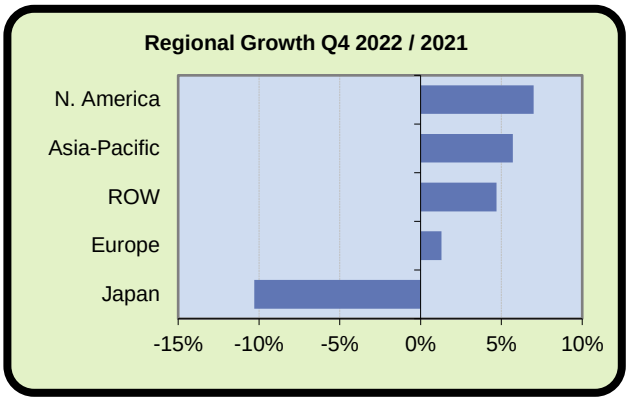
Many vendors have announced price increases in early 2023, with some indicating significant increases.

Demand in China will regain its strong growth trajectory as the country overcomes the surge of COVID infections.

PART N. LIFE SCIENCE INSTRUMENT REAGENTS

Overview

Products considered in this section are primarily consumables used with life science instrumentation, cell analysis, and laboratory automation systems. For the closing quarter of 2022, demand increased 5.1%. Organic growth for consumables was broadly strong, but severe negative currency effects continued to chip away at reported growth. Some vendors also noticed weakness, attributing the slowdown to labs making use of stock on hand.

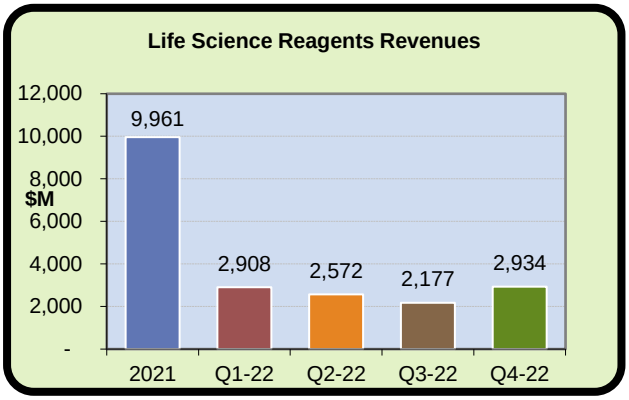


End-User Markets

Academia is the largest individual source of demand for these products, fueled by the continued elaboration of life science research applications. Fourth quarter demand was quite strong from academic labs in the US and China. In total, academia made up a full third of demand. Another third is shared between the pharmaceutical and biotechnology industries. Hospitals and clinical research form a tenth of the market; the general alleviation of the pandemic has caused research spending from this segment to decline.

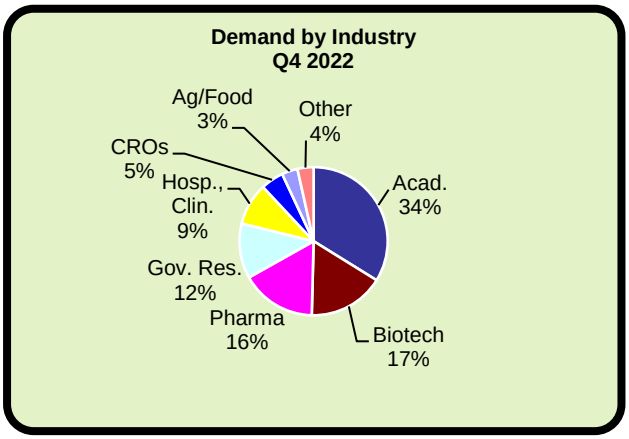
Market Developments

In January, Bionano Genomics announced the introduction of next generation versions of its reagent kits and chip consumable, along with updates to its instrument control software. Gyros Protein Technologies, a provider of peptide synthesizers and reagents and automated nanoliter-scale immunoassays, debuted in November the Gyrolab Human Cytokine Kit Reagents, the first in a range of new biomarker kits.



Regional Demand

North America experienced the strongest growth in the fourth quarter, with academic spending showing strength, adding to the continued healthy demand from biopharma. Asia-Pacific spending also saw better than average increases, partly tempered by some weakness in China due shifting pandemic policies. Other APAC countries were more uniformly positive in terms of growth, although Japan was beset by the sharp decline in the yen, which entirely masked the organic growth in the country.



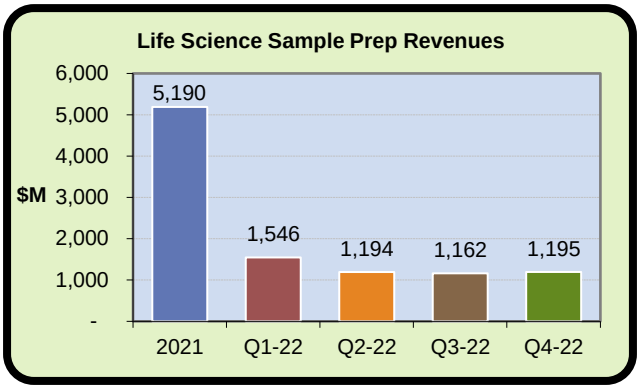
Near Term Prospects

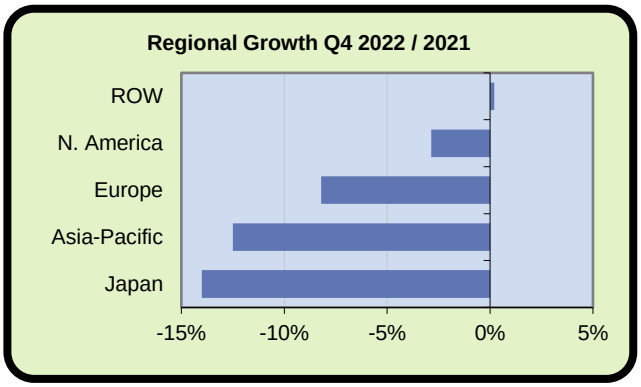
New sequencing systems entering the market should result in accelerating consumables revenues. More broadly, increasing throughput in the life sciences will help drive consumables demand, and growth rates should continue to edge upwards through the calendar year 2023.

PART O. LIFE SCIENCE SAMPLE PREPARATION

Overview

Life science sample preparation includes both automated purification systems and magnetic bead purification systems, in addition to related components, consumables, and service. This segment does not include diagnostic applications, but instead focuses on life science research. The fourth quarter of 2022 continued to see declining demand for COVID testing, while the quarter also proved to be weaker among other use cases.



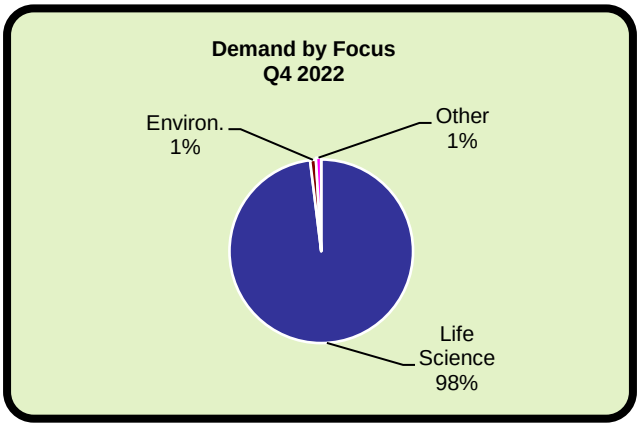


Regional Demand

The sudden reversal of China's zero COVID policy in December meant the end of most COVID diagnostic testing in the country, as the mass testing that had been conducted in many major cities came to a halt. Elsewhere in the world, COVID testing continued to decline across all other regions as well. These factors combined with difficult currency effects in nearly all regions have accelerated the decline in demand for NA prep for COVID diagnostics.

End-User Markets

Life science-related functions account for nearly all use of life science sample prep products. These include a myriad of functions in research, development of therapeutics, use in the food industry for product development and safety, preparation of clinical samples for diagnostics, and much more. There has been increasing focus and funding for environmental testing in recent years, contributing to steadily increasing demand.



Market Developments

In December, Bionano Genomics, a maker of optical genome mapping technology, acquired Purigen Biosystems, a maker of automated nucleic acid extraction and purification systems. In December, Two Square, a provider of sample prep solutions, was acquired by Pion. Two Square's PrepEngine system is an extraction, mixing, centrifuge, and lysing instrument.

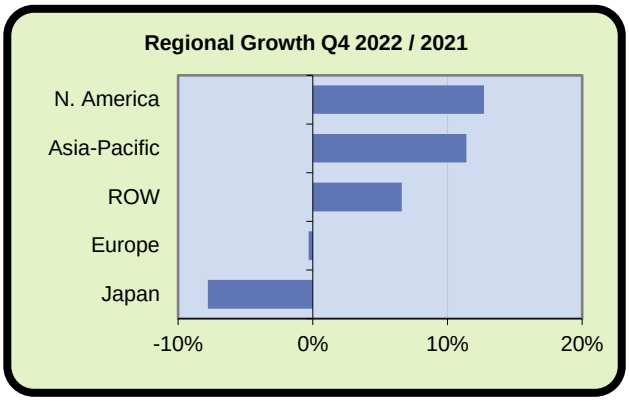
Near Term Prospects

The abrupt change to China's COVID management will cause disruptions. However, demand will stabilize as operations and supply chains in China are finally able to recover from the pandemic. China has also increased its funding for new labs and lab expansions. Elsewhere, macroeconomic uncertainties will continue to create a challenging environment, even as the NIH releases increased funding in the US.

PART P. ANALYTICAL CHEMICALS

Overview

Total demand for analytical chemicals and solvents grew 6.9% year-over-year for the final quarter of 2022. Q4 revenues reached $714 million, the highest total of the year, but with the lowest year-over-year growth. For the year, growth is estimated at 8.2%. Consumables spending was driven by increasing throughput across many industries, including environmental testing, industrial labs, and even academia. Price increases also helped lift revenue in 2022.

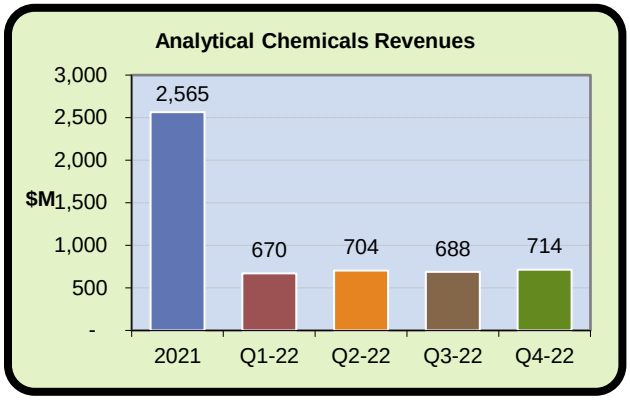


End-User Markets

By function, demand is concentrated particularly among laboratories with a combination of high throughput and high consumables dependence. QA/QC labs make up the largest segment, supported by significant contributions from chromatography testing in pharma and other industries. Likewise, analytical service labs often have high volumes as they serve many customers and optimize instrument usage. These two functions made up more than half of all Q4 demand.

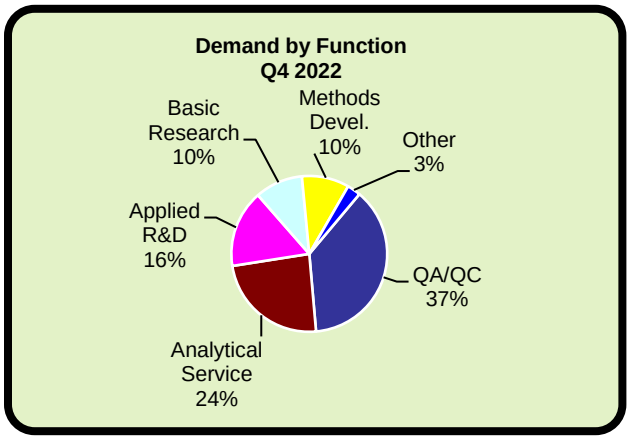
Market Developments

Avantor opened its most advanced new distribution center in Dublin, Ireland in November. The new facility will offer cGMP warehousing, clean rooms, batch-to-batch traceability, custom palletization, and product quality inspections. In December and January, Calibre Scientific acquired two distributors of chemicals and other lab products: the Brazilian distributor Carvalhaes and Spanish distributor Glass Chemicals.



Regional Demand

Negative currency effects were again strong in Q4 2022, with the most significant effect in Japan, causing reported demand to decline in Q4. Although European demand was fairly strong in constant currencies, the negative effects wiped out these gains in terms of reported demand. North America had a weak comparison period in 2021, helping to make this quarter's growth quite impressive. North America and Asia-Pacific achieved double-digit growth in Q4.



Near Term Prospects

Although some supply chain issues remain, the industry as a whole has adjusted to avoid significant pitfalls in keeping a steady supply of chemical products for laboratory use. Demand in 2023 is expected to begin the year with modest prospects, but improving as the year passes.