

Miniature and Micro Spectrometers: End-user needs, Markets and Trends

Miniaturization opens new In-line, On-field, Point-of-Care and Consumer Applications

THE MARKET OF MINIATURE AND MICRO SPECTROMETERS IS EXPECTED TO REACH \$ 300M BY 2021

REPORT OUTLINE

- Title: Miniature and Micro Spectrometers: End-user needs, Market and trends
- PDF
- 150+ slides
- € 4 990 - Multi users license

KEY FEATURES OF THE REPORT

- Definition of miniature and micro spectrometers
- Unique market revenue breakdown between classical and miniaturized spectrometers
- Unique compact spectrometers market forecast by applications 2015-2021
- Main OEM spectrometers manufacturers and analysis of the players landscape
- Strategies for miniaturization of spectrometers
- Analysis of most promising applications

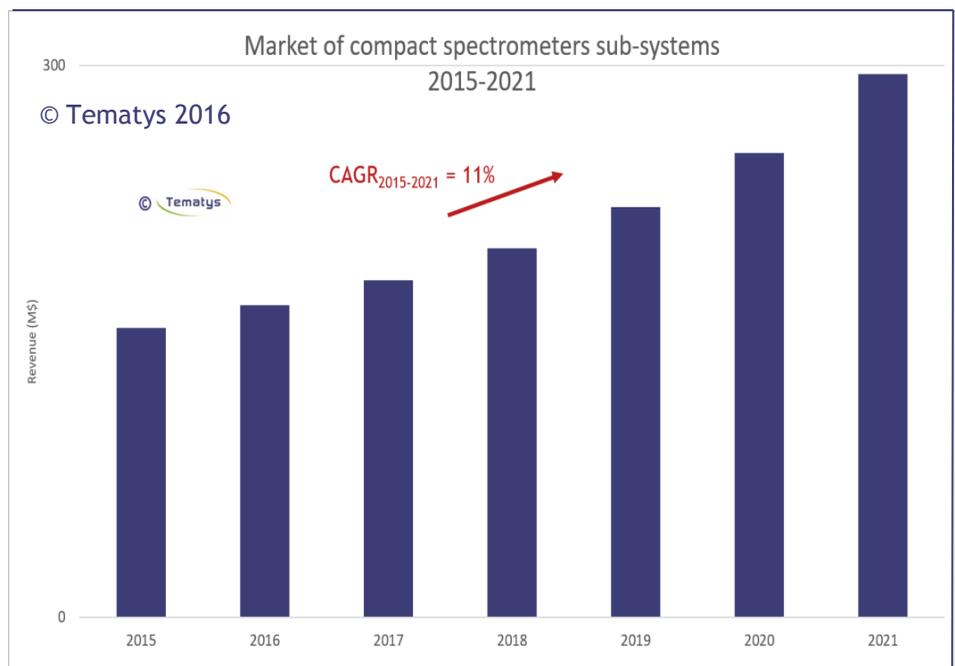
The molecular spectrometer systems market has reached \$ 4.5b in 2015. Inside this market, the fastest growing segment is the market of miniaturized spectrometers. Miniature spectrometers, and then micro spectrometers, were developed to make available the use of spectrometers outside analytics laboratories, thanks to an increased ease-of-use, a reduction of costs and a decreased time-to-result.

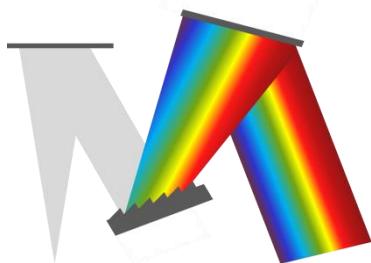
The total molecular spectroscopy market will experience a 7% annual growth rate while the market of mini and micro spectrometers is expected to grow at a CAGR₂₀₁₅₋₂₀₂₁ of 11%. This important growth will be due to a wider adoption of spectrometers on-field and for in-process applications in industry. Spectrometers manufacturers also target

Point-of-Care (POC) and consumer applications like food testing.

These large series applications are enabled by further decrease of size and costs of spectrometers thanks to innovative components like MEMS and MOEMS and designs.

The report provides the market revenue breakdown between conventional and compact spectrometers. It also includes detailed market revenue and units forecasts by application from 2015 to 2021 for mini and micro spectrometers and an analysis by segment.





IDENTIFYING MOST PROMISING APPLICATIONS

Miniature and micro spectrometers did not only replace classical spectrometers by bringing lab measurements to the field or the process line, they also open new applications where spectroscopy is not used today: precision agriculture, consumer food testing, etc. The range of potential applications is very broad.

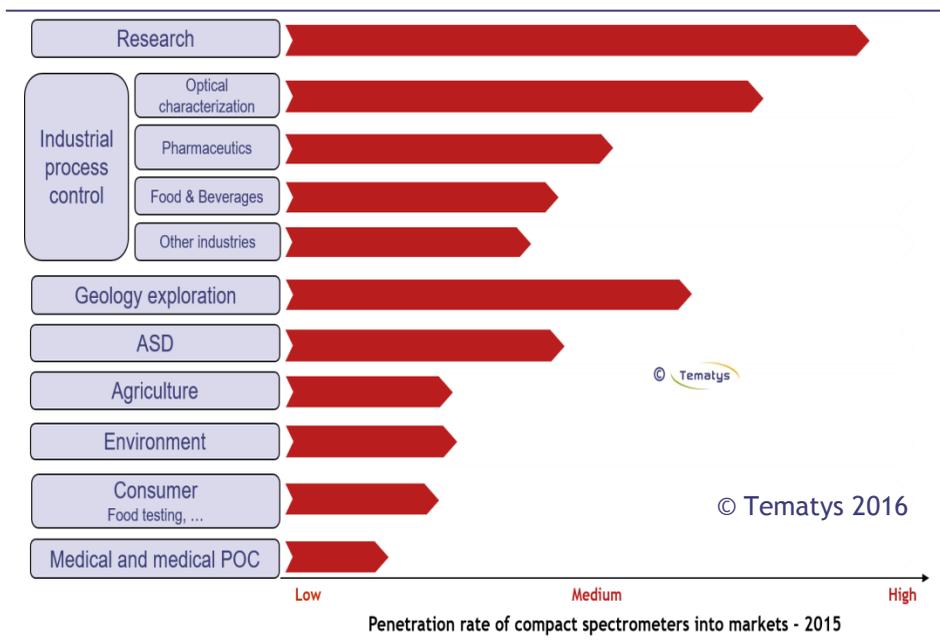
The market is split into a wide variety of niche applications, each one having its own requirements in terms of performance, costs, design, operating conditions, etc. It implies the development of products specific to each segment.

Currently Research and industrial optical characterization of LEDs, lasers and displays are the biggest segments. The rest of the market is more an accumulation of many custom developments.

However, the better knowledge of end-users needs and the arrival of new players close to end-markets will drive the adoption into on-field and industrial applications in the short term, and, in the mid-term, into POC and consumer use.

One of the most attractive sector is the food industry where mini and micro spectrometers provide reliable controls all along the value chain, from field to fork. Markets that will experience a high growth are Pharmaceuticals QA/QC, Food & Beverages, Agriculture, Environmental testing, medical POC and consumers applications (smartphone spectroscopy, food testing, etc.).

In this report, we provide a detailed analysis of most promising applications and describe the end-users needs and the remaining challenge for widespread use of compact spectrometers in these areas.



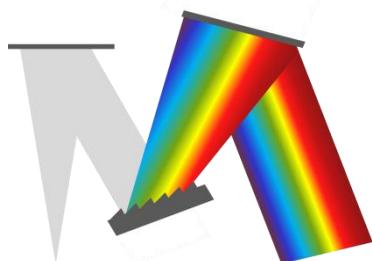
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CONTACT
 Corinne Tsamba
 ctsamba@tematys.com
 TEMATYS
 6 Cité de Tréville
 75009 PARIS
 Tel: +33 6 62 92 77 38
 Fax: +33 9 72 39 44 39
 www.tematys.com

A HIGH VALUE OUTSIDE THE SPECTROMETER TECHNOLOGY

To reach these applications, technological breakthroughs are necessary. Miniaturization is through new designs and disruptive technologies. Recent progresses take advantage of new micro-technologies such as MEMS (Microelectromechanical Systems) MOEMS (Micro-Opto-Electro-Mechanical

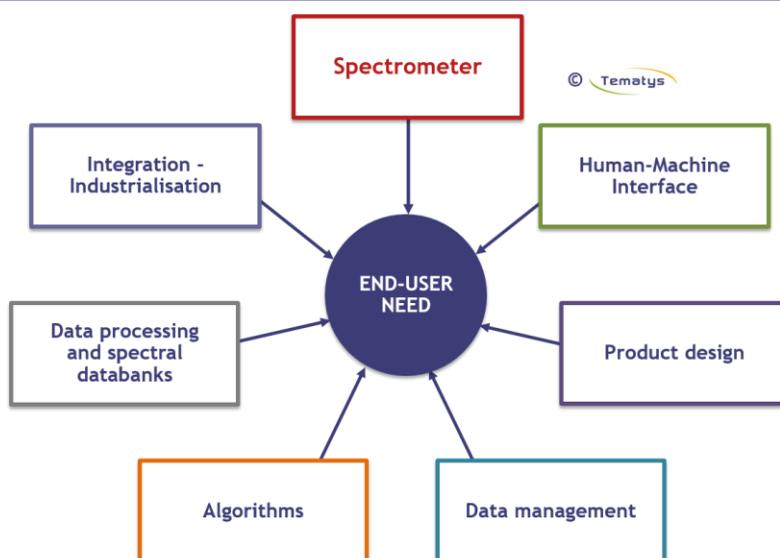
Systems), micro-mirror arrays or Linear Variable Filters to reduce cost and size of spectrometers while allowing good performance and high volume manufacturability. Integrated photonics are also used in some products to improve their robustness.



However, to reach industrial and consumer markets, it is also compulsory to develop application-oriented products. The hardware is not the only important part of the system. There is a high value in data processing, data interpretation, Human Machine Interface, product design, etc. to provide relevant information to end-users in the right way, all the more as devices based on spectrometers are going to be used by non-spectroscopy experts. They will only have expertise in their application field (agriculture, medical, etc.) and maybe have no scientific background at all for consumer devices.

A high part of the market value lies in this ability to adapt the technology to the function wished by end-users. The market is currently wondering how to undertake this adaptation effort, who is going to pay for it and who is going to catch the value.

This report describes the different strategies for miniaturization of spectrometers. It analyzes opportunities and challenges of different types of players to catch the value of the markets.



The spectrometer technology needs many other elements to serve the function wished by end-users.

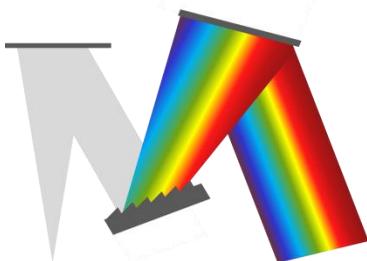
OBJECTIVES OF THE REPORT

- Provide a definition to discriminate between miniature spectrometers and micro spectrometers
- Provide the first market data and forecast for mini and micro spectrometers
- Describe and segment the various strategies for miniaturization of spectrometers at commercial and research levels
- List the applications of mini and micro spectrometers and determine the ones with the highest potential
- Understand end-users requirements and challenges to overcome for a wider adoption of mini and micro spectrometers

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CONTACT

Corinne Tsamba
 ctsamba@tematys.com
 TEMATYS
 6 Cité de Tréville
 75009 PARIS
 Tel: +33 6 62 92 77 38
 Fax: +33 9 72 39 44 39
www.tematys.com



AUTHORS



Clementine Bouyé is analyst at Tematys. She is an expert in Biophotonics and Industrial markets and technologies. She manages the production of several study reports on the market and trends of Photonics technologies.



Benoît d'Humières is an expert in Optics, Electronics and Instrumentation for industrial and research applications.

He has run many marketing and technological studies for major companies (THALES, ESSILOR, EDF...) and Research institutions

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COMPANIES MENTIONED IN THE REPORT

-Miniature and micro OEM spectrometers manufacturers: Admesy, Attonics Systems, Avantes, Axsun, B&WTEK, BaySpec, Block Engineering, Control Development, Equitech Int'l Corp, Gamma Scientific, getAmo, Hamamatsu Photonics, Headwall, HighFinesse Laser and Electronics Systems, Hiperscan, Horiba, Ibsen, Inision, Instruments Systems, IS instruments, JETI Technische Instrumente, Nano Optics Devices, Ocean Optics, Oto Photonics, Photon Control, PhotonTec Berlin, Radiantis, Resolution Spectra, RGB Photonics, Si Ware, Snowy Range Instruments, Solar Laser System, Spectral engine, Spectral Products, Stellarnet, Texas Instruments, Thorlabs, Tornado Spectral Systems, Wasatch Photonics, Zeiss Spectroscopy and others...

-Providers of measurement systems based on compact spectrometers are also quoted in this report.

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Miniature and Micro Spectrometers: End-user needs, Markets and Trends

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