



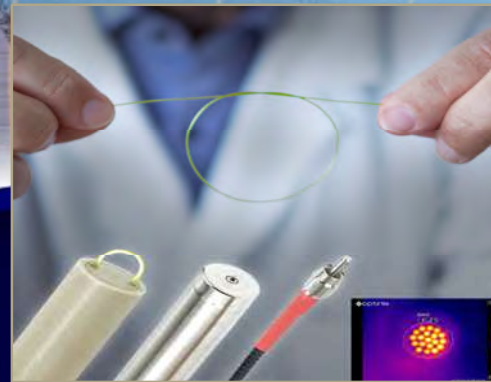
26 February 2025. 16:15-17:45 SGT. Marina Bay Sands, Singapore

EPIC TechWatch at APE




Viacheslav Artyushenko

Innovative Fiber Solutions for Life Photonics in 0.3-16 μ m Range








 **art photonics GmbH** was founded in Berlin in 1998 by Dr. V.Artyushenko for organic growth

 **25 Years Anniversary**

 QAS Int. - certified
DIN EN ISO 9001:2015
Certificate No. A1887GER

 R&D and production of specialty **fiber products** for the broadest spectrum range **0.3 – 16 μm**

 Unique technologies of **Polycrystalline InfraRed (PIR-)** fibers extruded from Silver Halides, **Hollow WaveGuides (HWG)** and Metal coated Silica fibers

 **Spectroscopy probes** for industrial process control in-line and medical diagnostics in-vivo

 **Joined Nynomic group in 2024** 

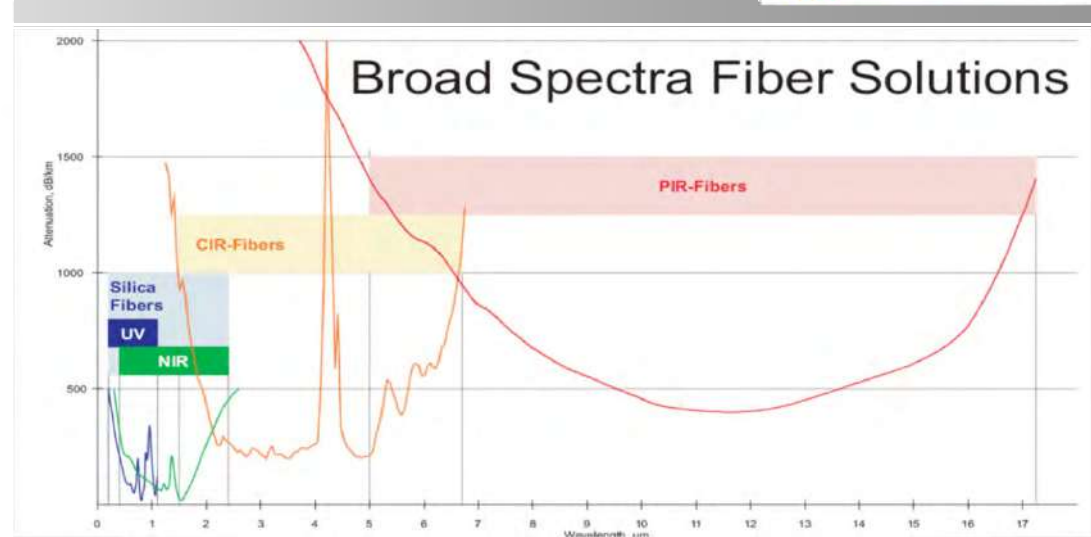
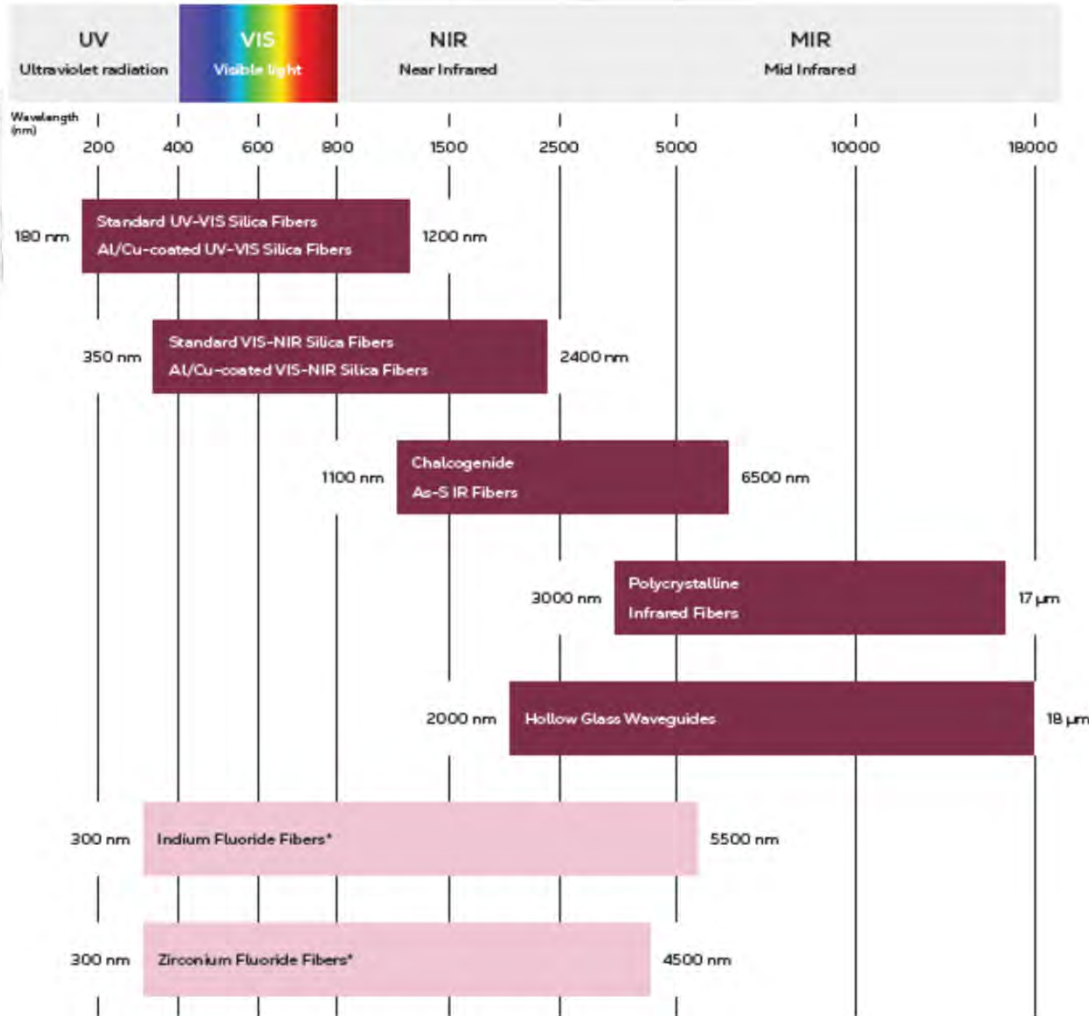


EPIC TechWatch at APE 2025, Singapore

Made in Germany

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Transmission Spectra of Different Fibers for Broad Spectral Range



Metal Coated Silica Fibers



Spectroscopy Market forecast, including remote process-control

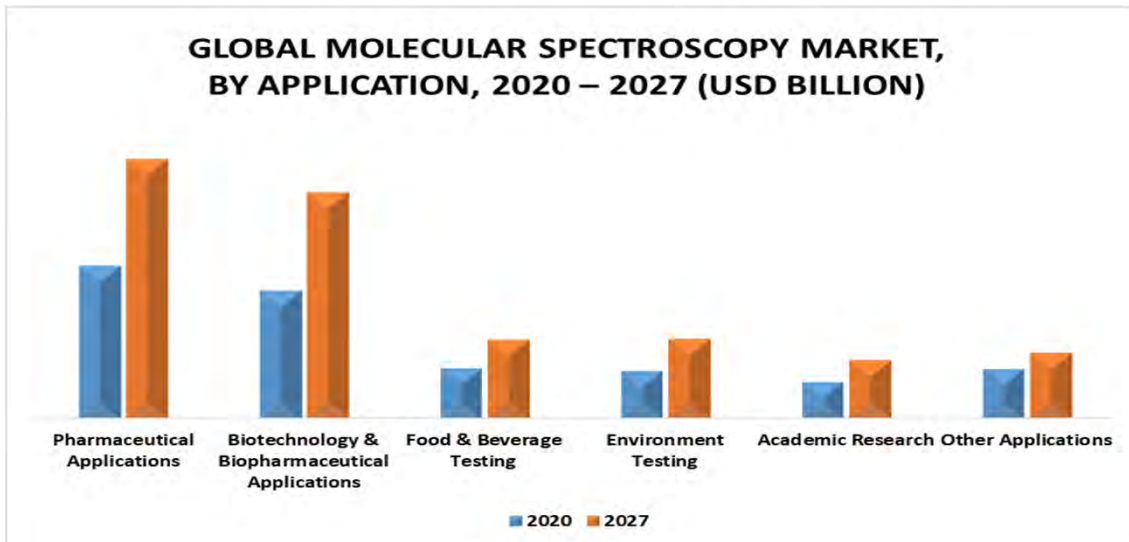


Main drivers of the growth this market:

- enhanced yield of chemical reactions
- improved product quality and purity
- growth of pharmaceutical, biotechnology industry
- food safety concerns
- remote media analysis for *in-citu* environment monitoring
- medical diagnostics *in-vitro*, *ex-vivo* and *in-vivo*



GLOBAL MOLECULAR SPECTROSCOPY MARKET, BY APPLICATION, 2020 – 2027 (USD BILLION)

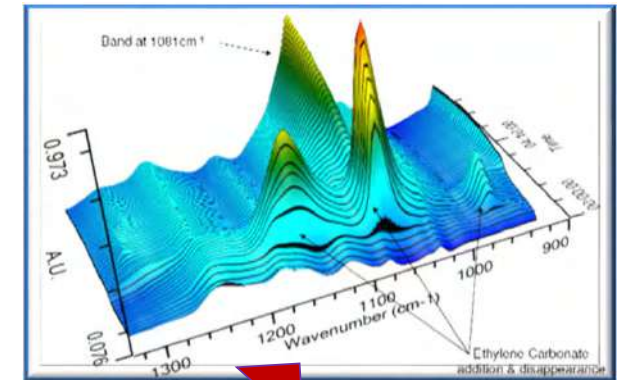


Replace „dead“ sample spectroscopy - to „live“ process-control



Robust & flexible fiber probes enable direct process-control *on-line & in-line*:

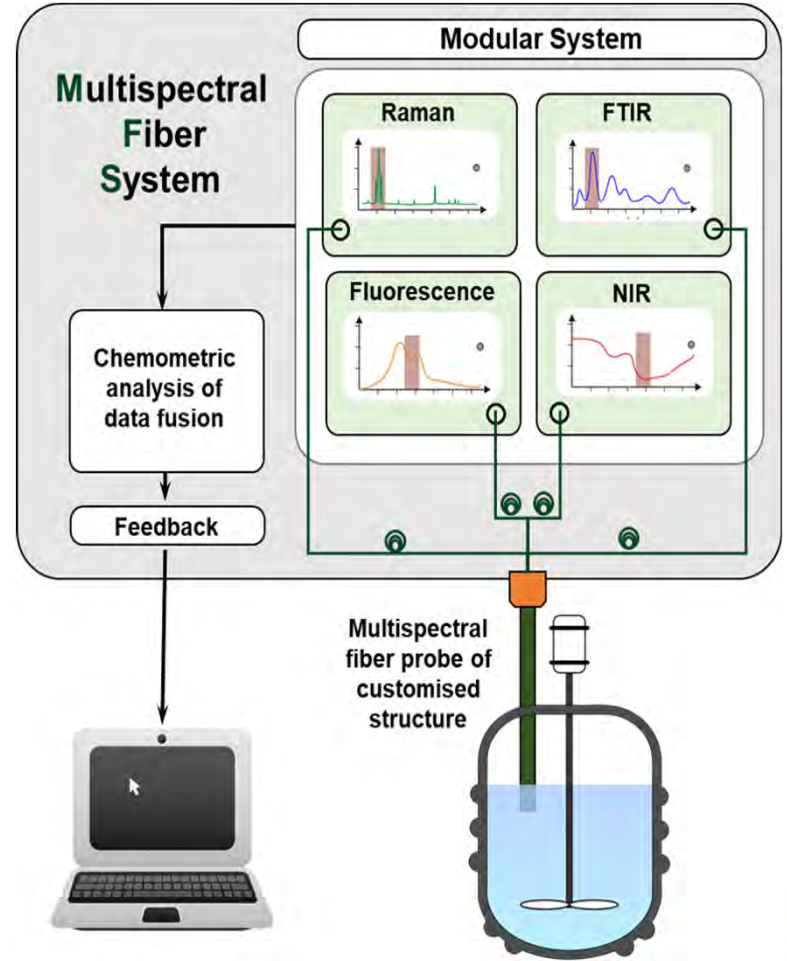
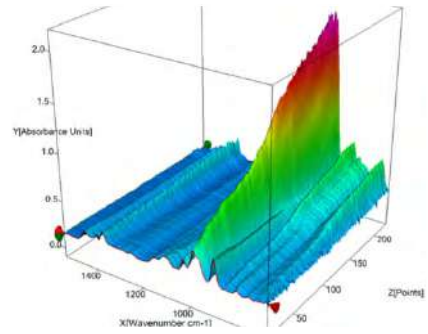
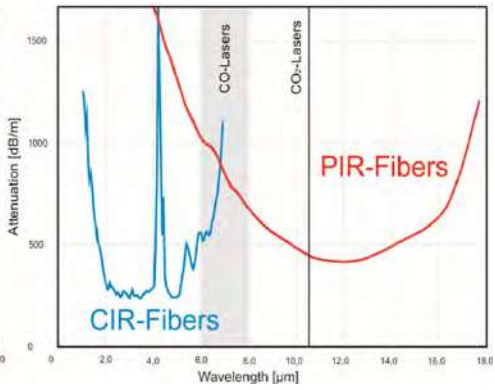
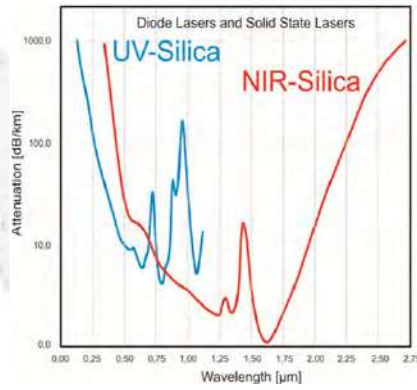
- Any spectroscopy method to use with no sampling
- Remote sensing for “hard to get to” reaction *in-situ*
- High or low temp, high pressure, pH, vibration, etc.
- Hazardous media – aggressive, toxic, etc.
- Multiplexed sensing in critical points
- Identify Transient Intermediates, etc.
- Reaction End-Point Determination
- Air / Moisture Sensitive Samples
- Reaction Initiation
- Kinetics Determination
- Real time analysis, no delay with results!



Gerzon, G., Sheng, Y., & Kirkitadze, M. (2022). Process Analytical Technologies—Advances in bioprocess integration and future perspectives. *Journal of Pharmaceutical and Biomedical Analysis*, 207, 114379.

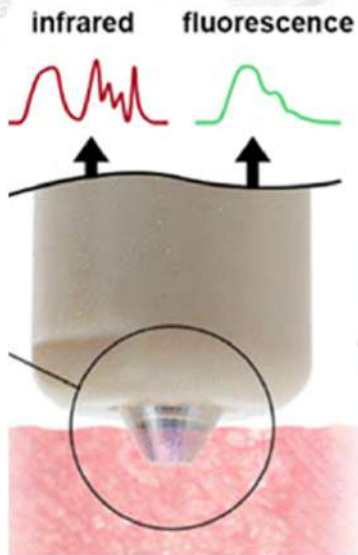


Multi-Spectral Fiber Systems to select the Best Process Control Method



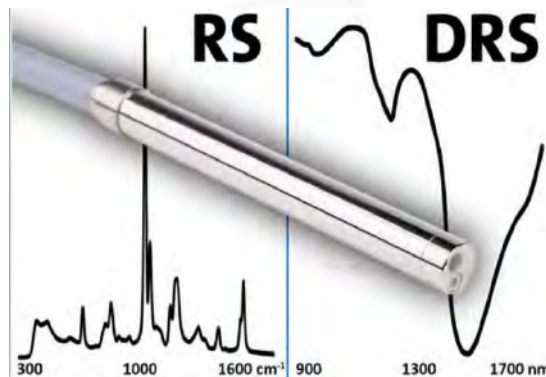
Combi-Probes for Multi-Spectral Process-Spectroscopy

ATR + Fluo (+ Raman)



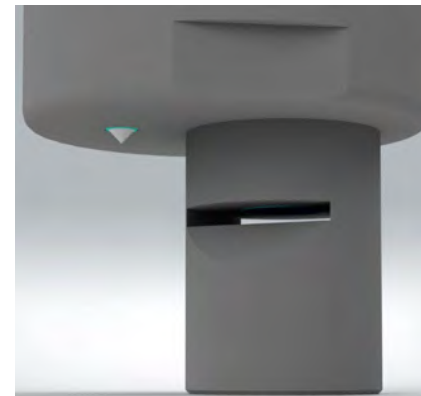
- OD=6.3mm
- 2-3 modalities
- Cost-effective lab design

NIR-Diffuse reflectance + Raman



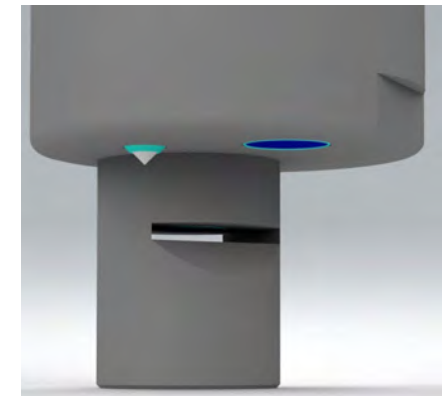
- OD=19mm
- NIR + Raman channels
- Straylight < 1%
- Heated shaft to prevent condensation
- Designed for bio-pharma

ATR + NIR-DRS



- 25 mm diameter
- ATR-FTIR channel
- NIR Transflex channel

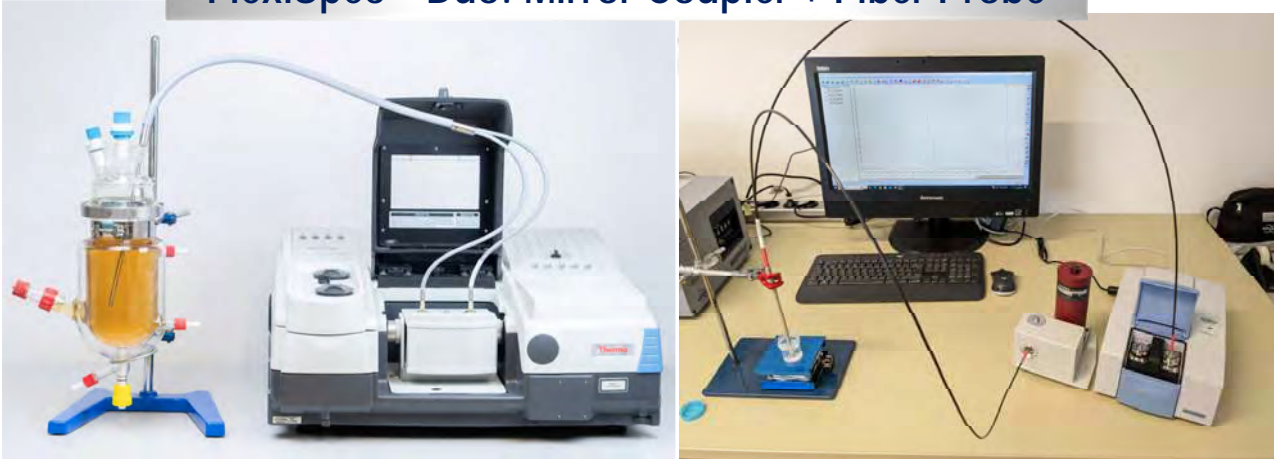
ATR + NIR-DRS + Raman



- 25 mm diameter
- ATR-FTIR channel
- NIR Trans-Flex channel
- Raman channel

Transfer your Bench FTIR to Process-FTIR-Spectrometer!

FlexiSpec®-Duo: Mirror Coupler + Fiber Probe

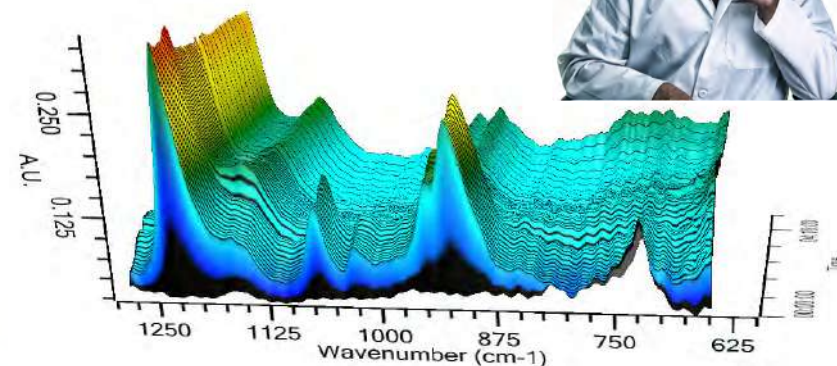


IR-Fiber Probes can be coupled with any process FTIR-spectrometers and with bench FTIR/-NIR-spectrometers - using various **mirror couplers** installed in sample chamber

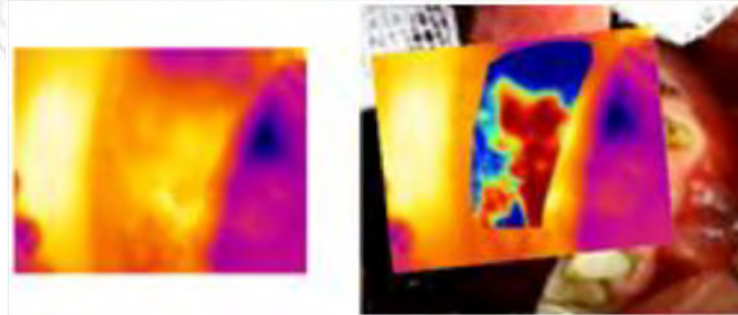
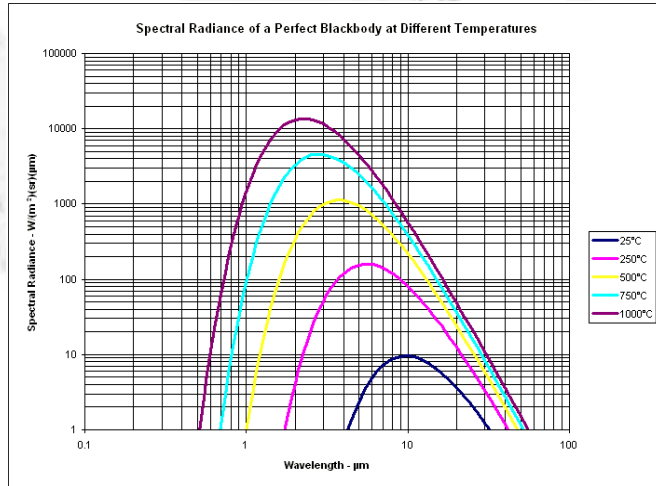


Why to make/ use Fiber coupled FTIR?

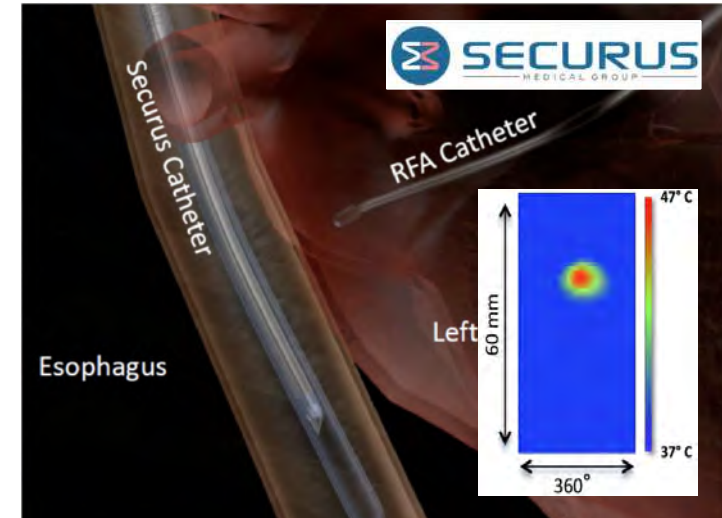
- Easy spectroscopy with no sample preparation
- Remote sensing for "hard to get to" Samples
- Identify Transient Intermediates; etc.
- Reaction End-Point Determination
- Hazardous Samples (toxic, aggressive, at high or low temp, pressure, pH, vibration, etc.)
- Air / Moisture Sensitive Samples
- Kinetics Determination
- In-situ Reaction Monitoring



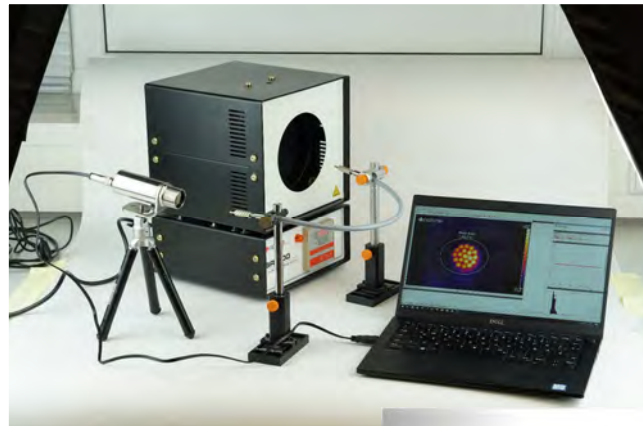
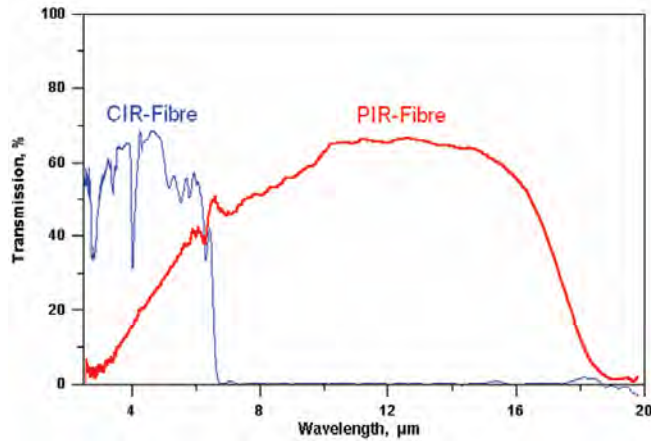
PIR-Fibers for IR-Imaging Endoscopy in Mid IR-Range



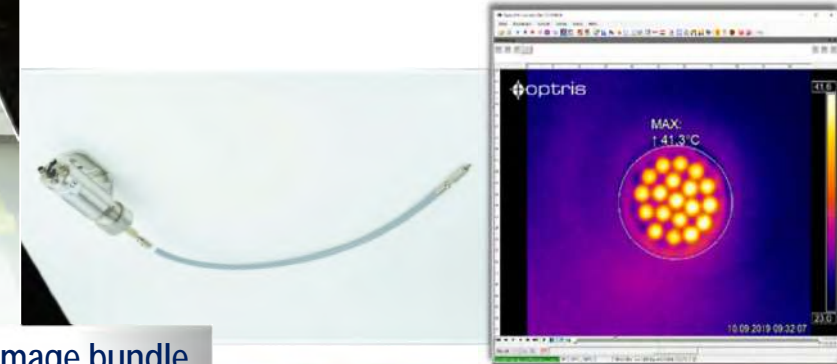
Classic thermography (left) vs HTB's HDI used in HDIntra (right)
www.htbioimaging.com



PIR-Fiber IR-imaging Endoscope



19xPIR-fiber IR-image bundle



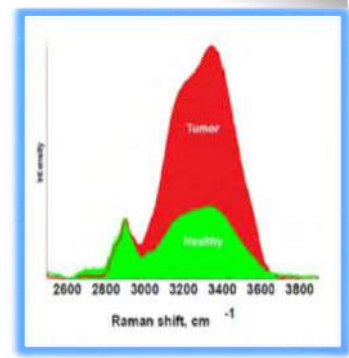
Needle Fiber Probe to define Tumor Margins by HW-Raman Spectroscopy

platform technology based on thin, flexible fiber optics for Raman spectroscopic tissue analysis

for application in tumor surgery procedures guided biopsy used in laparoscopic & robotic surgery



Single fiber Raman Needle Probe (OD < 180 μm) penetrates in resected tissue for 1cm to detect *ex-vivo* oral cancer (SCC) margins in 1s – providing HW-Raman spectrum each 100ms (i.e. with 1mm accuracy)

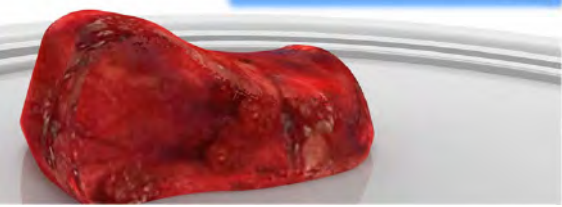


Water content is higher in Oral cancer vs surrounding healthy tissue, and can be used as biomarker to define tumor margins

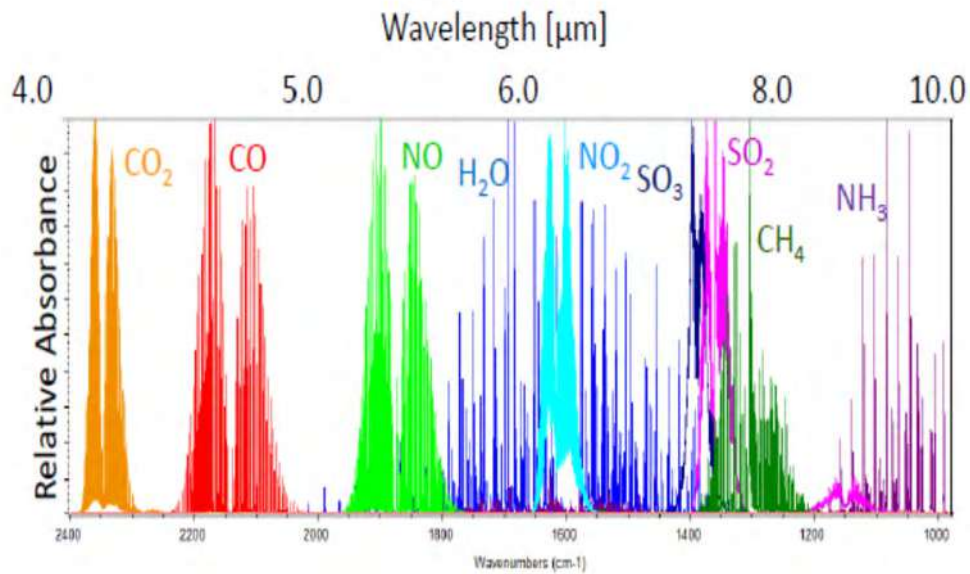
Financial support - the Dutch Cancer Society (Project 106467) and the EU-Eurostars-programme (Project 12076 - RA-SURE).

Analyst

Received 25th April 2023,
Accepted 19th July 2023
DOI: 10.1039/d3an00650f
rsc.li/analyst



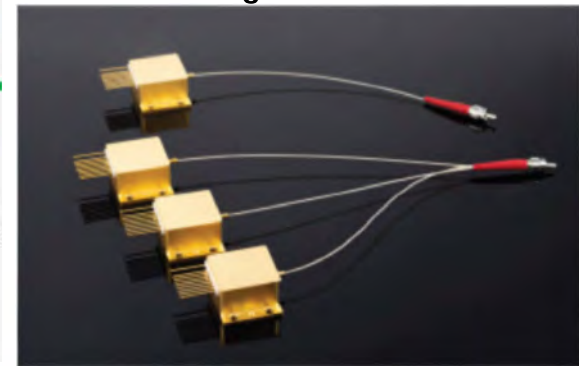
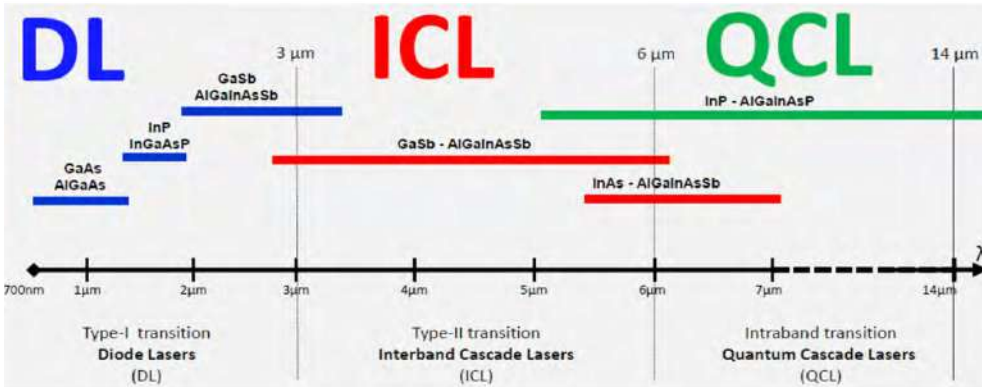
The 1st IR-Fiber coupled QC-Lasers for Medical Diagnostics



PIR-fiber bundle combines radiation of 7 QC-Lasers into Arthro-Probe

IR-fiber bundle combiner for any multiwavelength set of ICL or QCL

QCL with detachable IR-fiber cable



EPIC TechWatch at APE 2025, Singapore

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Main Trends of Fiber Diagnostic Solutions:

- ➔ **Fiber spectroscopy can be used in a broad spectral range and can combine spectral methods to enhance sensitivity, specificity and accuracy of molecular analysis for any media at remote distance in real time, including medical diagnostics *in-vivo* – for point of care & telemedicine**
- ➔ **Most of pragmatic applications could not accept too high cost, bulky and complicated spectral systems, but require a variety of customized fiber sensors – with small size, low cost, friendly software, compatibility with smart-phones and upgradable via iCloud to the enhanced databanks**
- ➔ **Spectral fiber sensors to be developed for clinics - to enable detection of tumor margins *in-vivo* and diagnostics of various diseases by tissues & bioliquids analysis - with WiFi data transfer to AI in iClouds for real time + even for robot & telemedicine (or for process-control *in-line* in industry)**

Since 2024 art photonics GmbH has joined Nynomic AG

Powerful Brands within the Nynomic Group

A growing number of companies, acquired strategically and all dedicated to permanent, non-contact and non-destructive optical measurement technology



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Thank you all and EPIC for TechWatch at APE`25!
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