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IR, UV-VIS instruments in India

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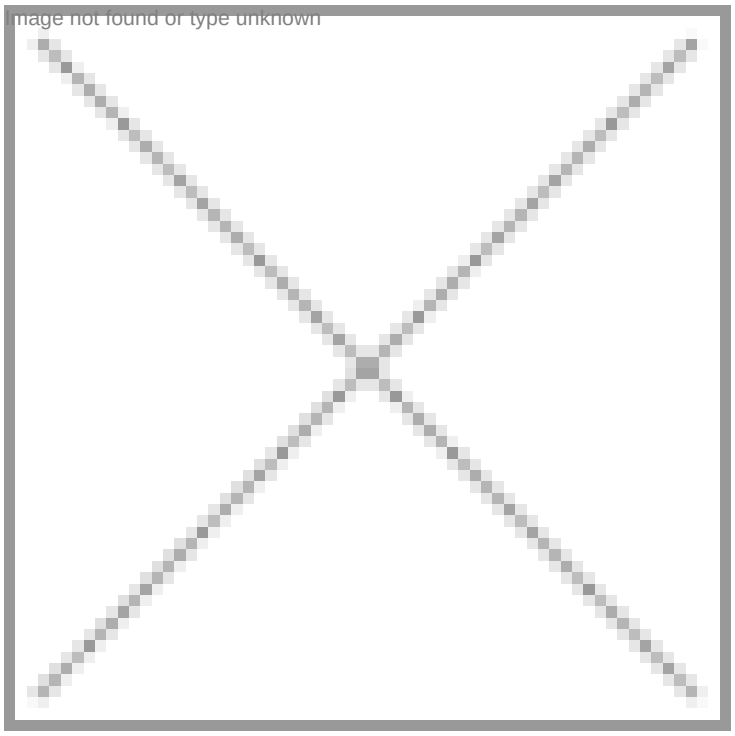


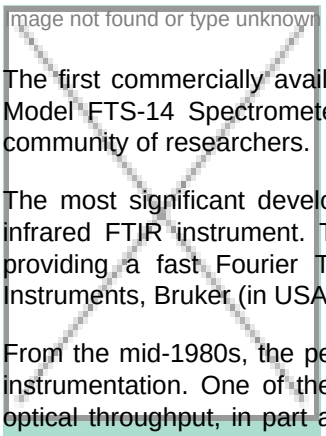
IR, UV-VIS instruments in India

The combined UV/VIS market in India is $16 million.

The history of modern instrumentation for optical spectrometry especially for Infra-Red (IR) and UV-VIS can be traced back to the 1940s. This started with the development of instrumentation for the testing of materials, such as petroleum products and polymers, to be used in the manufacture of military goods and equipment for use in World War II.

Commercial Infra-Red Instrumentation

Early instrument manufacturers included Beckman (USA), Perkin-Elmer (USA, UK and Germany), Pye-Unicam, Hilger, Grubb-Parsons (UK), Zeiss (Germany), in the Western markets and JASCO (Nippon Kogaku Company), Hitachi and Shimadzu in Japan. Essentially all of these instruments were based on dispersive monochromator designs, with most in a double beam configuration. It would be generally inappropriate to single out individual manufacturers or models--there were many different instrument designed and marketed during this 20 year period. However, it is historically important to mention the original Perkin-Elmer model 12 and the Beckman models IR-1 and IR-2. Design concepts from these instruments existed for at least 20 to 25 years in various derivative products.



The first commercially available Spectrometer Model 12 IR was manufactured by PerkinElmer. First commercial FTIR was Model FTS-14 Spectrometer. The First affordable high performance FTIR Model 5 MX was made available to a wider community of researchers.

The most significant development in 1970s was the introduction of FTS-14 by Block Engineering, a fully functional, mid-infrared FTIR instrument. This spectrometer, which became the start of a line of products under the Digilab company, providing a fast Fourier Transform calculation, as well the main ones being Nicolet, Perkin-Elmer, Digilab, Mattson Instruments, Bruker (in USA certain Bruker instruments were originally marketed by IBM), Analect, Bomem and JEOL.

From the mid-1980s, the period is best described as a time of enabling technologies, specialized application and dedicated instrumentation. One of the benefits gained by the move to FTIR instrument technology was the overall improvement in optical throughput, in part achieved by superior detector technology. As a result, over the past 15 years there has been a rapid expansion in the availability of novel sampling accessories that provide opportunities to handle almost any type of sample, and to be able to acquire a useful spectrum within 1 or 2 minutes. With a high sensitivity detector, it is no longer a problem if the energy losses due to the sampling accessory limit the light throughput to a few percent.

Anil Nimkar is working in Perkin Elmer (India) Pvt Ltd and is a product manager for Infrared Spectroscopy (FTIR/NIR, PUF) for developing business in West Asia. He is working for Perkin Elmer products for last 20 years and he was involved in marketing and handling of other analytical techniques like Chromatography, Real-time Measurement and also Life Science Products.

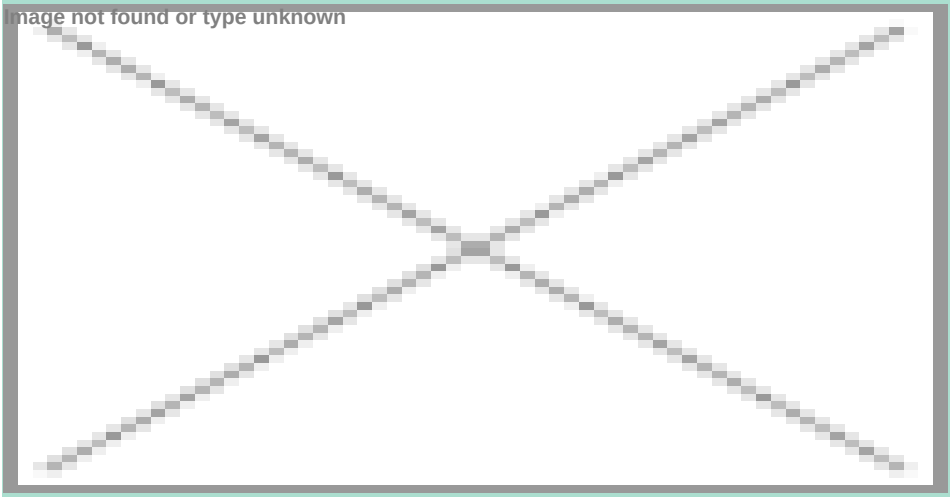
The major FTIR companies--Bio-Rad-Digilab, Nicolet (including Spectra-Tech), PerkinElmer;Jasco Bruker, Bomem and Shimadzu--offer systems and packages for these new applications from high-end to low-end.

An evolution has taken place in terms of the format of infrared instrumentation and in most cases, this has been market/application driven. With the exception of the high-end research instruments, these can be characterized as:

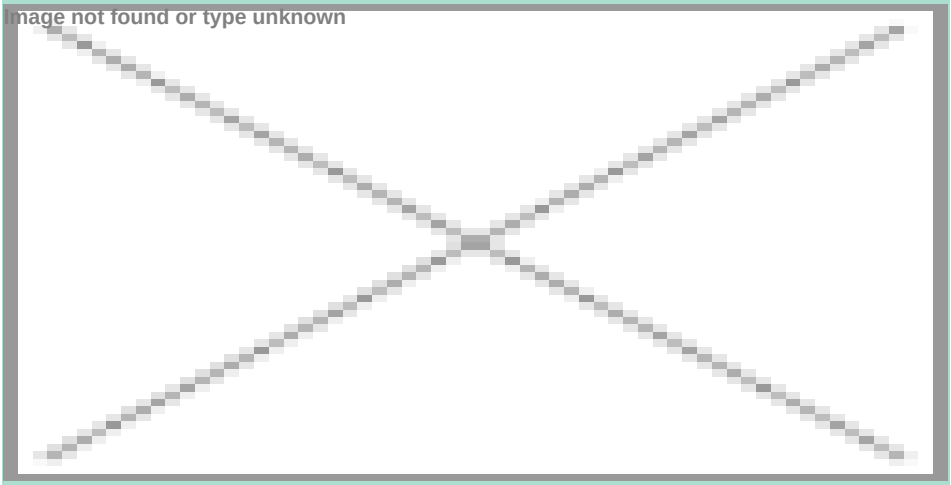
- The multi-faceted analytical system
- Compact, flexible routine systems
- Customized analyzers

Modern NIR instrumentation falls almost exclusively into the category of customized instrumentation. However, the form of the instrumentation can be very different, depends on the applic ation. The most traditional instruments can be classified in two ways; laboratory-based instruments for method development and plant-based instruments, including environmentally hardened instruments for on-line measurements. These tend to feature common technology for both forms of instrument â€“ simplifying the task of data and calibration transfer. FT-NIR instruments (optimized for near-infrared measurements) have gained popularity and these systems are now offered by many of the traditional vendors, including Bomem, Analect, Nicolet, Bruker and Perkin Elmer.

IR market growth in India is around 12 â€“ 15% per annum.



Number of Vendors by Price Point



Many of the newer NIR systems are custom designed for specific areas of application. The two most significant directions have been for small field portable instruments and on-line analyzers. The small field portable systems, features a range of technologies, including lED or diode laser sources, fixed optical filters (including integrated filter/detector combinations), or photodiode arrays. They are typically used for pilot plant studies (chemicals and fine chemicals) and raw materials QC/QA, as well as food, pharmaceutical and petroleum product manufacturing applications. Recent interest has focused on biomedical and clinical applications, with special attention to the measurement of blood glucose level for diabetics.

FTIR market and the products available in India

FTIR and NIR markets are very diverse in terms of its utilization hence they are sold in the specific applications that the instrumentation performs. These can be classified as routine or non-routine instruments.

Routine: The instruments are used for day-to-day performance with a fixed task, identification, quantification, in process or final materials, in academics teaching etc.

Non-routine: The instruments which are used for trouble shooting and research and development purpose, spectroscopic evaluations, product development where the utility of FTIR or NIR will vary as per the purpose.

The FT-NIR analyzers market has several vendors and specific technologies. The market in India has been growing for last few years and around 250 units ($9 million) of IR and NIR products have been sold.

Infra-red market is growing in India. FTIR is well established and Near-IR is getting accepted in the Process Analytical Technology (PAT). However, Indian market is price sensitive. There are plenty of opportunities in routine as well as non-

routine market with the involvement of hyphenated techniques such as IR-Microscopy Imaging, TG-IR, Optical measurements and Chemometrics.

Commercial UV-VIS Insutrumentation

The earlier UV/VIS instrument manufacturers included Beckman, PerkinElmer, Pie-Unicam, Varian, Hitachi, Shimadzu, Jasco, Bausch & Lomb etc. Initially the instrumentation was filter based, then single beam spectrometer which is followed by double beam spectrometers which got well established in the Vibrational Spectroscopy. The Beckman Model DU Spectrometer was the first commercial UV/VIS Spectrometer marketed in 1941. Then there were series of instruments from Beckman, PE, Varian establishing their various brands like; Beckman DU series, PerkinElmer Lambda series & Varian Cary series. These were also competed by the various instruments from Hitachi, Shimadzu as well as Jasco.

The UV/VIS spectrometers currently offered by number of vendors can be segregated with a price point. Double beam UV/VIS Spectrometer includes the most advanced instruments in the UV/VIS market today. They allow more rapid and simplified UV/VIS analysis for the users.

In the medium range spectrometers, there are more than 22 vendors. However the vendors active in the Indian market include: PerkinElmer, Shimadzu, Varian, Thermo, Hitachi, Jasco, GBC etc.

Various instrumentation such as single beam, split-beam, dual beam and double beam spectrometers are available in the market. However, double beam UV/VIS spectrometer includes the most advanced instruments. They allow more speedy and simplified UV/VIS analysis for the users. The double beam UV/VIS instrument is dominated by the major diversified analytical manufacturers such as Perkin-Elmer, Shimadzu, Varian, Hitachi, Thermo, Jasco and others.

The basic double beam instruments remain same, however the high performance instrumentation got established especially from UV/VIS and UV/VIS-NIR for the diverse group of industrial end market including material, glass & non-optical, coating & paints, pharmaceuticals, life science, semi-conductors and textiles. These industries which were initially established in the North America & Europe and growing fast in the emerging markets such as PACRIM including China & India. The high-end products are mainly manufactured by PE, Varian, Hitachi etc. The various measurements were carried out by this technology and many reflectance accessories were used such as Integrating Spheres, Relative and Absolute Specular Reflectance accessories. These accessories were developed for many applications and customized which were followed in the commercial market. The combined UV/VIS-NIR market in India is around $16 million which is growing at 10â€“12 percent annually. This is mainly because of the growth and the industrial development in various sectors such as material, glass & non-optical, coating & paints, pharmaceuticals, life science, semi-conductors and textiles.

The IR & UV-VIS Instrumentation is establishing in the growing Indian market in various areas for day-to-day utilization as well as for the demanding applications of material characterization. The meaningful accessories like integrating spheres, various reflectance accessories and microscopy imaging techniques are having opportunities to increase the quality of life.

Reference : Analytical Instrumentation
Handbook by Galen Wood Ewing.