SPECTRAL ENGINES
MEMBER OF THE NYNOMIC GROUP

APPLICATION NOTE

PORTABLE DEVICES

PORTABLE MATERIAL SCANNERS EXPAND BUSINESS OF NIR SPECTROSCOPY

Background

Near Infrared (NIR) spectroscopy is a proven technology for material identifications in laboratories. The challenge in using laboratory instruments relates to their price, size and also to the fact that they are mainly used by professional laboratory personnel. NIR spectroscopy based portable analyzers have partly solved the challenge of using NIR spectroscopy in out-of-lab applications. The outstanding challenges with these portable devices relate to their large size and high price point, which limits the use of existing devices only to specific cases.

Spectral Engines technology brings laboratory-instrument performance into a pocket-size device. Near-Infrared (NIR) spectroscopy is powerful technology for the identification of unknown materials. Portable analyzers are used in several different measurement applications, such as polymer classification, textile material quality inspection, and pharmaceutical raw material identification. All these applications have been evaluated with laboratory instruments to prove the suitability of NIR spectroscopy for the measurements. Spectral Engines technology enables these measurements and analysis to be carried out in out-of-laboratory context at a fraction of the cost of typical laboratory equipment.

Spectral Engines' solutions

Spectral Engines product offering is based on mass producible NIRONE™ spectral sensors. Even though the size of NIRONE Sensor is small, the performance is very well comparable with the performance of laboratory instruments. Spectral Engines utilizes the so-called true NIR region from 1350 nm to 2150 nm in its measurement specifications. This range offers very good selectivity and sensitivity in material inspection applications compared to broadly used shorter wavelength technologies e.g. silicon sensor technologies.

Spectral Engines has developed NIRONE™ Scanner, a solution for creating material sensing products, which combines powerful NIR spectroscopy and advanced machine learning algorithms. It is the world's smartest, fastest and easiest way to create your unique material sensing solution. It fits very well to field inspection applications.

The key benefits of Spectral Engines' solutions are:

- Fast and reliable detection of counterfeits, illegal drugs, and explosives
- Rapid, non-destructive measurement without a need for sample preparation
- Cost-effectiveness
- Connectivity and portability
- Easy-to-upgrade libraries via cloud-based tools

USE CASE

Raw material identification of pharmaceutical products

Raw material identification plays a crucial role in pharmaceutical production quality control procedures. It is essential to quickly verify the chemical structure of raw materials. Raw material identification ensures the quality of the final products, reduces production waste and saves time. NIR technology is already accepted and supported by the main Pharmacopoeias, such as the Japanese Pharmacopoeia (JP), the US Pharmacopoeia (USP), and the European Pharmacopoeia (EP).

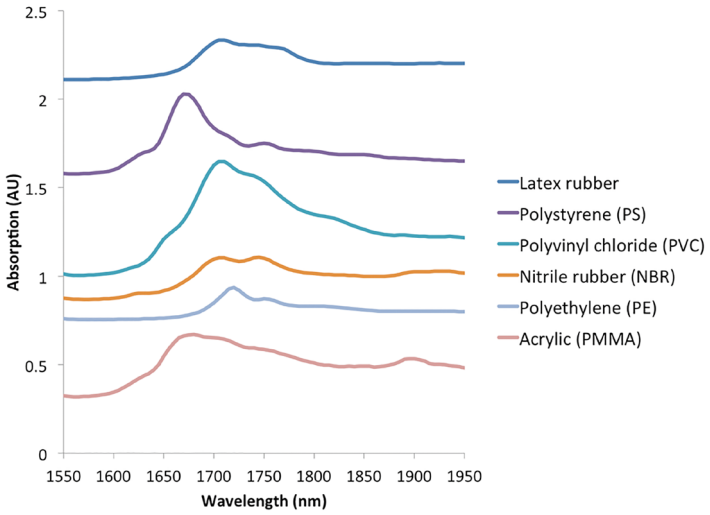
Spectral Engines products are suitable for the quick analysis of raw materials. NIR spectroscopy does not require any sample preparation as such, it is easy and fast for operators to use. Portable material scanners can be connected to a cloud library that provides access to spectral signature libraries of different materials which can be constantly updated.

USE CASE

Plastics material classification

Identification of plastics and polymers in general is necessary for the proper sorting of materials in recycling. Recycling and sorting requires fast, cost-effective and highly accurate analyzers.

We measured a selection of typical plastics found in household appliances and consumer products. These included latex rubber, polystyrene (PS), polyvinyl chloride (PVC), nitrile rubber (NBR), polyethylene (PE), and acrylic or polymethyl methacrylate (PMMA). We used Spectral Engines NIRONE 2.0 spectral sensors to measure the reflectance spectra in the 1550 to 1950 nm range. This range is excellent for the identification and classification of materials because C-H bonds absorb IR radiation in this region. Each material has a unique spectral fingerprint which enables the classification and identification of the materials.

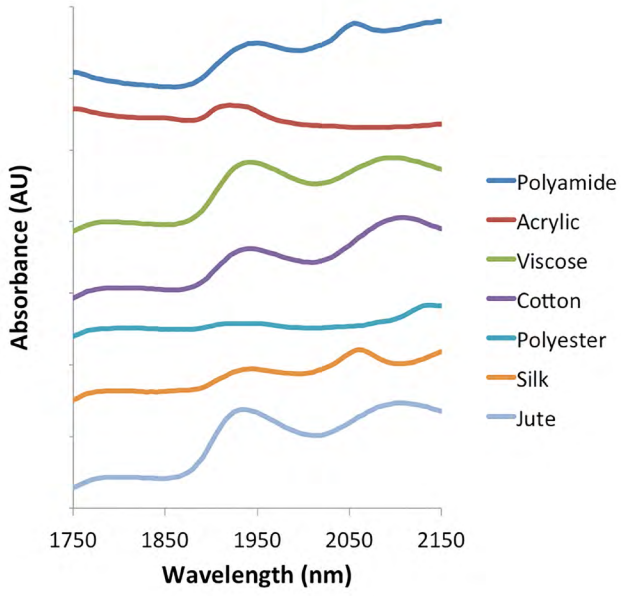


USE CASE

Fast verification of the authenticity of materials and textiles

The fashion and clothing industry is a global multi-billion-dollar business. The textile industry has a massive number of players, including producers of counterfeit clothing and footwear as customs agencies around the world are trying to seize and destroy fake goods, they need methods to distinguish non-genuine clothing items from genuine ones. Counterfeit clothes can look and feel almost exactly like genuine items.

Near-infrared (NIR) spectroscopy is used in the analysis of different textile types. The chemical and physical characteristics result in variations in the spectral features of different materials. Textiles can be identified based on these features. A number of typical textiles were measured. We found that NIRONE 2.0 and 2.2 sensors perform very well in the classification of textiles based on the spectral data.



Conclusion

Spectral Engines' solutions provide small, robust and fast measurement technology for field material sensing applications. Spectral Engines technology exploits the so-called true NIR region (1350-2150 nm), which means better sensitivity and specificity in material sensing applications. Cost-effective sensors can be combined with advanced machine learning algorithms to increase the performance of NIR spectroscopy in demanding identification or classification use cases.

FOR MORE INFORMATION:
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