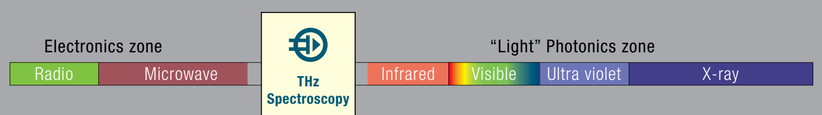
NOVATRANS NEW THZ SPECTROSCOPY SERVICE

Novatrans now offers a new Terahertz spectroscopy service including the preparation of samples, measurement and comprehensive analysis report.

- Terahertz (THz) molecular spectroscopy is a novel spectroscopy based on wavelengths located between the domains of the microwave and the infrared (10-100 cm^{-1}, 100-1000 µm).
- Radiation at THz wavelengths couples strongly to many crystalline materials and **provides a unique probe for studying crystalline structures, polymers, water-proteins networks**, and similar matrices where intermolecular interactions play an important role.



- Lately, THz has been **recognized by the FDA** as a viable technique for Process Analytical Technology (PAT) which is a regulatory framework established to facilitate introduction of new manufacturing technologies that enhance process efficiencies and understanding.

About Novatrans

Novatrans Group is a Swiss company founded in 2003 with a science base in Israel for R&D. Novatrans is engaged in developing and commercializing next generation electronics systems and devices for attaining the THz domain. As part of Its Terahertz offering, Novatrans now offers a Terahertz measurements service which includes the entire process of preparations, measurements and analysis report.

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TERAHERTZ SPECTROSCOPY SERVICE

A new spectral window to materials

NOVATRANS

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WIDE SPAN OF APPLICATIONS

Polymorph discrimination and quantification

Many crystalline solids have unique spectral fingerprints in the THz frequency domain, and therefore can be identified with high confidence. Moreover, it has been shown that different packing of the same molecules (polymorphism) gives rise to very different THz spectra.

- THz spectra follow Beer-Lambert's law, which enables quantification of a specific polymorph in a mixture with other materials or determination of the fraction of each polymorph in a mixture of polymorphs
- Since THz energy levels are very low, THz spectroscopy can non-destructively determine the polymorphic forms and crystalline state of active pharmaceutical ingredients (APIs) presenting analytical performance which is equivalent to or better than traditional spectroscopy techniques.
- THz spectra can be supplemental to data from other methods, and used to **enhance and protect the intellectual property on specific polymorphs**.

Moisture content determination

THz waves are highly absorbed by water molecules, enabling the accurate quantification of small amounts of water in samples, which can be solids (either bulk solids or powders) or non-polar liquids (such as oils, petroleum derivatives, and more). Typical applications are determination of water content in granulates, crude oil, paper, tobacco, etc.

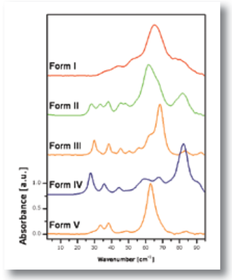

Figure 1: THz spectra of sulfathiazole polymorphic forms. Spectral features relate to intermolecular interactions. (Spectra offset for clarity, courtesy of TeraView, Cambridge, UK).

Spectroscopy of gems and minerals

- Minerals are crystalline in nature, and many exhibit distinct spectral features (fingerprints) in the THz frequency range.
- This property can be exploited for **identification and quantification of mining materials** with potential applications such as: exposing counterfeits, and assessing the purity of precious stones and gems; identifying major, minor and trace minerals; identifying composition of minerals that bear on the process; quantifying minerals; determining particle size distribution; investigating mineral liberation; determining surface coatings on minerals, and more.

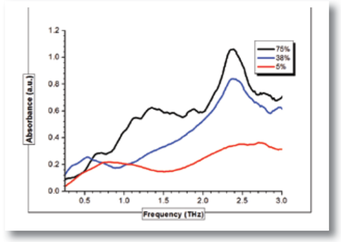

Figure 2: THz spectra of semi-crytalline polymers, showing changing spectra with increasing crystallinity.

Analysis of layered materials

- THz radiation penetrates deeply (up to a few millimeters) into dry non-metallic materials, and is efficiently reflected from interfaces between different layers.
- This enables the direct measurement of layer thickness and density in multi-layered or composite materials.
- Combined with imaging, this property may also be used to provide a THz image of the internal structure of such materials.
- Typical applications are: non-destructive, contactless characterization of coating layers thickness and uniformity on metal and polymer automobile/aerospace structures including the unique ability to identify the presence of defects and to investigate their origins in multi-layered panels.

Biopolymers conformation analysis

- Large molecules often give rise to very low frequency vibrational modes, which may be probed by THz radiation.
- Due to the high sensitivity of these modes to intermolecular forces, THz radiation can be used to identify different conformations of such molecules.
- Typical uses are probing different folding states of proteins, determination of specific vs. non-specific binding of molecules to DNA strains without the use of bio-markers or fluorescent probes (which may affect the binding), detection of point mutations in DNA, and more.

Polymer spectroscopy

Although most polymers and other amorphous materials do not have specific spectral features in the THz frequency range, their physical properties may nonetheless be investigated using THz spectroscopy in a non-destructive manner. Properties such as mean average molecular weight, percentage of cross-linking, layer thickness in multi-layered polymer sheets, determination of additives in polymer materials, defects in plastic components, and many more may be investigated using THz-spectroscopy.

Tablet coating imaging

THz imaging provides the ability to nondestructively analyze the coating layer thickness and quality of coated pharmaceutical tablets.

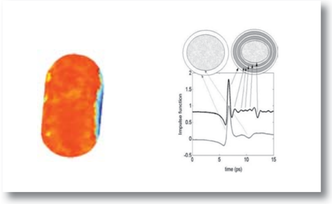

Figure 3: False-color 3D THz pulsed image (a) of enteric coating tablet determined from the THz time-domain waveform (b) of the tablet (courtesy of TeraView, Cambridge, UK).

- Because it is non destructive, tablets can be re-examined at later times to monitor coating stability and integrity or used for further functional studies with prior knowledge of the coating uniformity.
- THz imaging determines the thickness, uniformity, distribution and coverage of simple and complex coatings. Structural features such as cracks, dislocations and delaminations in single and multilayer cores are also revealed.

Spectral imaging

2D spectral imaging may be employed, for mapping the distribution of all material properties mentioned above. Typical applications are the spectroscopic imaging of plastic parts, to verify material uniformity, and biomedical imaging.

3D imaging

3D THz imaging (tomography) may be performed, to non-destructively reveal the internal structure of non-metallic components. Typical applications are non-destructive testing of composite materials parts and of electronic components packaging, online process control of layered products, quality control of plastic joint-welding, and quality control of painted parts, artworks reconstruction, and many more.