

Accelerate product development and guarantee in specification performance during scale-up and manufacture

Summary

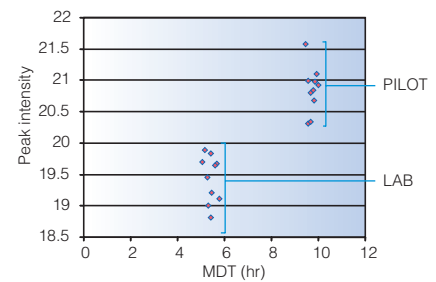
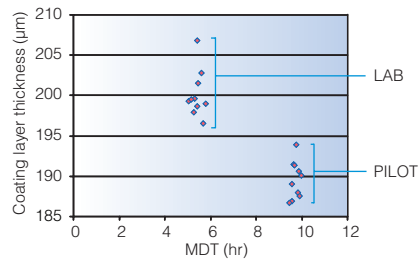
The TeraView proprietary terahertz platform can be used to non-destructively:

- ▼ Troubleshoot product failures at all stages of development that are related to dissolution changes, core integrity, or other factors
- ▼ Develop robust product and processes for scale up to manufacture
- ▼ Monitor product attributes affecting stability
- ▼ Design and predict changes in drug release profiles



Controlling dissolution during tablet scale up

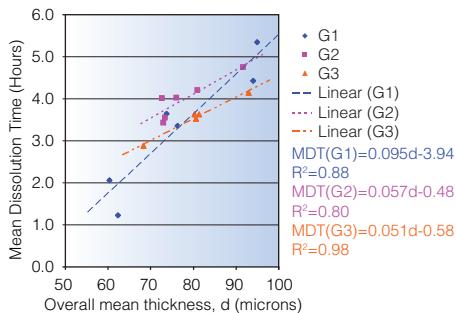
Terahertz peak amplitude, a measurement of coating density and an indicator of dissolution, is used to maintain and ensure in-specification performance during scale up of a sustained release product. The measurement takes into account the porosity of the coating, unlike coating weight gain.



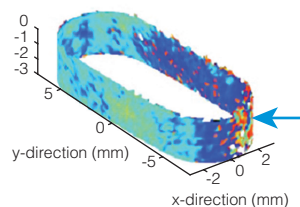
As mean dissolution time (MDT) changes during scale-up this is reflected in the terahertz coating thickness and peak intensity measurements.

Predicting dissolution through tablet imaging

Terahertz imaging shows why tablets coated to release drug in the lower intestinal tract are dissolving in an erratic fashion. The mean dissolution time correlates to the terahertz measurements for coating thickness. Terahertz imaging offers a potentially faster method for determining variation in dissolution rates.



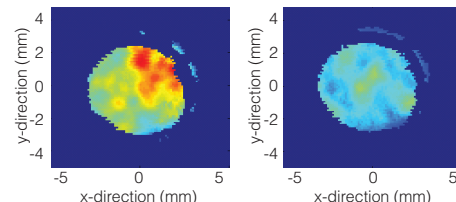
Correlation of coating thickness with onset of dissolution.*



Terahertz imaging maps the coating thickness, uniformity and region of tablet failure.

Controlling process transfer of a multi-layer tablet

Terahertz imaging non-destructively measures the buried interfaces between two layers of a bi-layer product. The measurement allows the formulation and compression parameters to be optimised for improved adhesion between the layers in the tablet core.

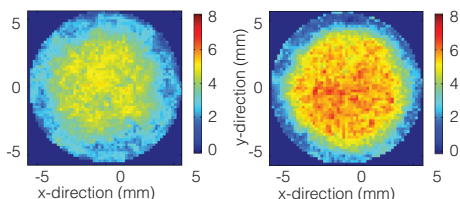


Images of the buried interface between the two layers in a tablet show the variation in adhesion. The LHS tablet exhibits very poor adhesion between the layers.

*Data courtesy of JA Spencer, FDA from a study published in the Journal of Pharmaceutical Sciences.

Effects of film coating process on a finished drug product

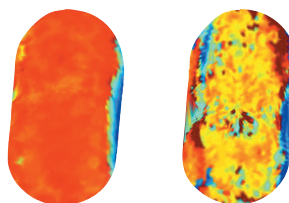
In this example, terahertz imaging monitors the effect of changing the solids level of a coating suspension from 15% to 25% to reduce the coating process time. The result shows a change in adhesion between the coating and substrate justifying further investigation on stability.



Colour images of the coating core interface shows a slight variance in adhesion between the 25% solids coating (LHS) and the 15% solids coating (RHS).

Investigating failure in an enteric coated product

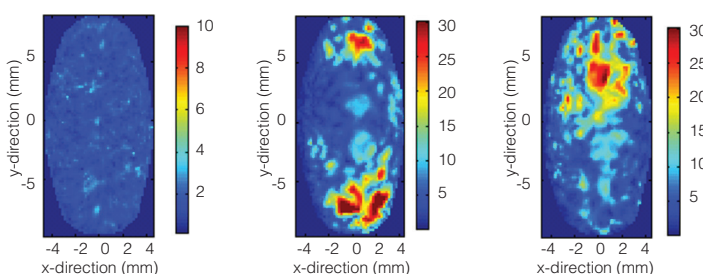
Terahertz imaging non-destructively reveals poor sub-coat uniformity beneath an enteric coating that was not evident through the usual method of measuring weight gain. The resulting dissolution failure is due to interaction between the enteric coating and the tablet core.



Terahertz imaging showing uniformity (RHS) and non-uniformity (LHS) of a subcoat under an enteric coating layer.

Defining the compression process window for an anti-viral product

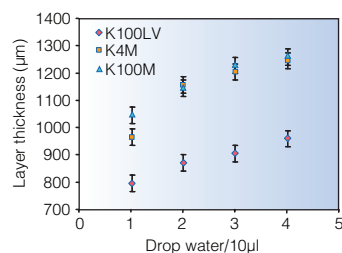
Terahertz imaging identifies compression process limits for the manufacture of a tablet prone to latent capping. Virtual cross sections of the tablet reveal those compression parameters that cause cracking (yellow/red areas) deep in the tablet core. As a result the compression parameters could be more accurately defined to ensure high quality of the finished product.



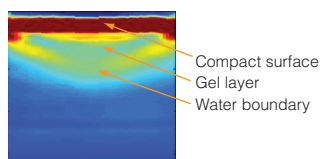
Non-destructive cross sections clearly identify cracks at depth within the tablet core. LHS image shows a good quality tablet. The additional images show tablets with integrity problems.

Determining moisture uptake and gel formation in modified release tablets

Terahertz imaging monitors moisture uptake through coatings and in compacts made from various controlled release grades of hypromellose. Images, taken within the first few minutes of water application, improve understanding of the hydration process and show how terahertz can be used to measure gel layer thickness, rate of diffusion and investigate drug release rates.



Gel layer thickness v moisture uptake for various HPMC grades.



Terahertz image of moisture ingress into a tablet.

TeraView Terahertz Pulsed Imaging technology adds value

- Use non-destructive imaging to investigate effects of formulation and process changes on the structure and critical quality attributes of a dosage form
- Correlate terahertz information with other tests on the same tablet for successful root cause analysis
- Gain in-depth information from non-invasive 3D dosage mapping with full virtual cross-sectioning capability
- Build surface and depth data into dosage form knowledge. See details in the tablet such as fractures, agglomeration, interaction between coatings and cores, coating thickness and uniformity
- No sample preparation and versatility to evaluate a wide range of solid dosage forms regardless of shape and size.