

# CW Terahertz Scanning Refletometer (TeraScanR)

#### Direct quantitation of diffusion gradient and kinetics

TeraScanR<sup>©</sup> uses a proprietary EO dendrimer source that generates stable CW T-ray at room temperature. The front-end allows the user to acquire either the permeation kinetics or the concentration profile across the thickness of a substrate in a non-destructive (non-invasive) fashion. The result is a unique analytical tool that can probe samples across the entire Terahertz gap.

**TeraScanR** is cost-effective with higher performance because of its next generation technology.

A high power source enables probing of a wide variety of specimens.

#### **Specification highlight**



Figure 1. Terahertz scanning reflectometer

Parameter	TSR <sup>1</sup>
Depth resolution	~20 nanometer
Depth range	~25 millimeters
Time resolution	~6 µs @ high speed
Technology	EO dendrimer
Source power	40mW, ~2mW at sample
SNR	>2000
Mode	Reflection
Operation	Ambient

<sup>&</sup>lt;sup>1</sup> Specifications may change

## **Applications example**

### **Kinetics and dynamics of diffusion**

An analyte-substrate combination has unique rate of diffusion (or permeation) that is characterized by

Fick's first law:

$$V = -D \frac{\partial C}{\partial x}$$

and Fick's second law:  $\frac{\partial C}{\partial t} = D \frac{\partial C^2}{\partial r^2}$ 

where, *J* is the flux,

*D* is the diffusion coefficient,

*C* is the concentration. and

Since, T-ray can penetrate the interior of a substrate, both  $\frac{\partial C}{\partial t}$  and  $\frac{\partial C}{\partial x}$  can be measured in the sub-surface locations or across the depth.

TeraScanR offers a capability of direct measurement of these two quantities. From these two quantity, a given analyte-substrate combination can be fully characterized.

And for T-ray, this is a non-invasive, non-destructive, and label-free characterization.

An example of three solvents is shown in Fig. 2.



Fig. 2. Permeation kinetics of different solvent in to photo-paper.



Fig. 3. Sketch of concentration profile.

When an analyte permeates through a substrate, it may have a concentration distribution across the thickness. Accurate measurement of this penetration characteristic (depth profile) is vital for transdermal drug formulation as well for a number of personal care products.

TeraScanR directly measures the depth profile. An example is shown below.



Concentration gradient ( $\partial c/\partial x$ , green curve) of an active ingredient (caffeine) across the stratum corneum (SC) obtained from the difference between the blank SC (blue) and the same SC treated with 1% caffeine solution (red).

For more information, please contact:

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