Ultra-fast determination of ink stability and packing

- Investigating the differences due to pigments -

PAINT & INKS

Introduction

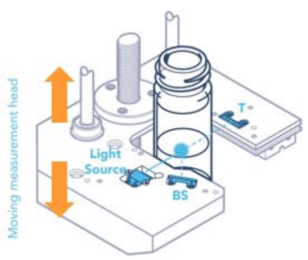
Inkjet formulations contain pigment particles that destabilize over their shelf life, leading to instability in forms of particle sedimentation and packing. Such events can cause poor product performance and even the clogging of inkjet ports, requiring instrument shutdown while the printing head is cleaned. While mixing by jet head movement or manual shaking may re-distribute the sample to its native state, predicting the instability in the first place is beneficial to avoid such product failures in the future. Here, the Turbiscan is used in order to quantify and predict the instability phenomena associated with various inkjet formulations.

KEY **BENEFITS**

- FAST
- NO DILUTION
- SENSITIVE

Reminder on the technique

Turbiscan® technology, based on Static Multiple Light Scattering, consists on sending a light source (880nm) on a sample and acquiring backscattered (BS) and transmitted (T) signal over the whole sample height. By repeating this measurement over time with adapted frequency, the instrument enables to monitor physical stability.
The signal is directly linked to the particle concentration (φ) and size (d) by the Mie theory knowing refractive index of continuous (n_f) and dispersed phase (n_p):



$$BS = f(\varphi, d, n_p, n_f)$$

Materials & Method

Two inkjet samples, one made with red pigment and another with yellow, were analyzed to observe the differences achieved by using different pigments. Each sample was then scanned every 30 minutes for 3 days in order to produce the destabilization profiles.

Effects related to sedimentation, packing, and overall phase separation can be determined.

Results

Raw data

Raw data from the dispersions is seen in Figure 1. From this graph, it is possible to identify occurring destabilization phenomena.

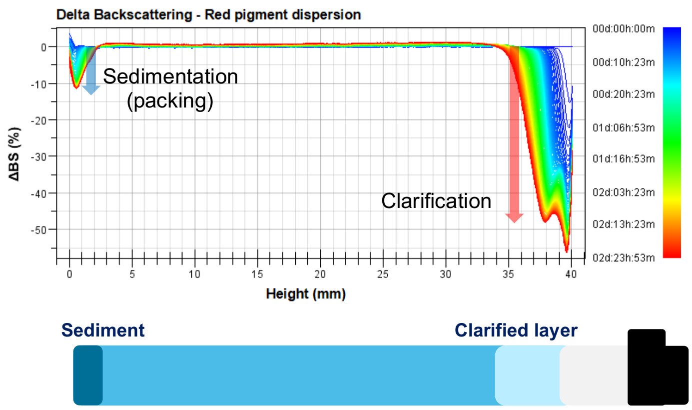


Figure1: Delta of Backscattering data from Red pigment dispersion

At the top of the sample (right of the graph) there is a large negative signal in the backscattering (BS) region, indicating that particles are moving away from this region as the sample begins to clarify. At the bottom of the sample (left of the graph) there is a negative signal that is developing. Typically, a sedimentation is seen in such samples and would be reflected by an *increase* in BS data. **Here, a *decrease* is seen;** both dependent diffusion and aggregation go in the same direction and prove the packing of the sediment layer.