STABILITY OF PIGMENT INKJET INKS

Abstract

Stability is a key issue for the formulator developing new inkjet ink formulations using pigments. Sedimentation can take place in such systems due to the difference of density of the pigment particles compared to the continuous phase. This phenomenon cannot be eliminated *via* viscosity increase due to technical constraints in the cartridge. Aggregation can also arise leading to packing of the sediment. All these phenomena can be monitored and quantified using the Turbiscan®. Analyses are done on the real product, without dilution and can be accelerated through temperature increase and automated with the ageing station (Turbiscan ags).

Keywords: inkjet, pigment, suspension, stability, Turbiscan®.

Introduction

More and more of the inkjet inks are becoming pigment based, as they give more environmentally friendly products that also have a better durability and compatibility with the packaging. However, the colloidal properties of pigments are much more complicated than dyes. These are soluble and therefore do not show common instability phenomena such as sedimentation and/or aggregation. The main problem with dyes remains the solubility parameter and, in some cases, the crystallisation than can appear over time and changes in the external conditions (temperature, *etc.*). Pigments, on the other hand, are solid particles that are not miscible in the continuous phase and tend to settle and aggregate. These destabilisations can have a great impact on the quality of the finished product (concentration gradients, blocking of the jet leading to inconsistency of the colour, *etc.*). Keeping the pigments in suspension in the cartridge is therefore the day-to-day challenge of the formulator. To do so he can play around with various additives in order to wet the particles, prevent them from agglomerating and avoid any sedimentation.

However, because of the opacity of inks and their high concentration of particles, the analytical tools available to help the formulator are not numerous. Common techniques such as visual observation are not only time consuming, subjective and tedious but they also give only partial information on the system, giving no insight into particle size variation. Particle size analysis, on the other hand, is not appropriate to such system, as the dilution taking place during the analysis can modify the colloidal properties (de-flocculation, *etc.*).

In this paper, we propose the use of the Turbiscan® technology as an analytical tool designed to monitor the stability of ink formulations and compare their stability. We discuss various types of ink such as yellow inks that are known for being the most difficult to formulate. We also go through the different behaviours encountered as observed with the Turbiscan®.

Experimental procedure

1. Principle of the measurement

The heart of the optical scanning analyser, Turbiscan®, is a detection head, which moves up and down along a flat-bottom cylindrical glass cell (Figure 1)[1-2]. The detection head is composed of a pulsed near infrared light source (λ = 880 nm) and two synchronous detectors. The transmission detector (at 180°) receives the light, which goes through the sample, while the backscattering detector (at 45°) receives the light scattered backward by the sample. The detection head scans the entire height of the sample, acquiring transmission and backscattering data every 40 µm. The Turbiscan LAB can be thermo-regulated from 4 to 60°C and linked to a fully automated ageing station (Turbiscan ags) for long-term stability analyses. Increasing temperature is the ideal parameter to accelerate destabilisation processes, while maintaining realistic testing conditions.

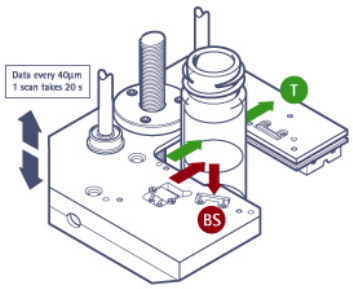

Figure 1. Principle of Turbiscan® measurement