

Studies of Agrochemical formulations

Stability measurement with Turbiscan®



Introduction

The use of agrochemicals by both professionals and novices alike has expanded with a wide variety of materials available. Fertilizers are used to deliver nutrients and facilitate the growth and development of plants while others are used to combat pests, insects, and fungi that may damage these crops and plants. Agrochemical dispersions are being constantly reformulated and optimized as customer demand increases for new materials with wider and better functionality. The development of a dispersion must take into account the compatibility of active agents, their environmental impact, and the shelf stability and potency of the product throughout the lifetime of the formulation, providing a challenge to the formulating chemist.

KEY BENEFITS

QUANTITATIVE
SENSITIVE
NO DILUTION

Formulation of Agrochemical Dispersions

Agrochemical dispersions are used for a wide variety of crop and pest treatments and can exist in a variety of forms, including emulsions and suspensions. Commonly used formulations need to be studied with regards to the 2 types of formulations used:

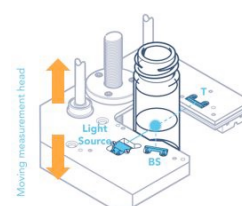
- Concentrates that require long term stability as they will be stored for weeks or months before being diluted.
- Dilute and final formulations that usually are stable for shorter time periods but need to be stabilized only for the duration of the application: hours or days.

Defects in formulation homogeneity in the spray tank can affect the potency and effectiveness of the dispersions due to particle flocculation and phase separation events. Formulating these materials to reduce these phenomena is key to developing a quality product.

Additionally, the high demand for new, environmentally friendly reagents requires these dispersions to be re-formulated and the stability determined. This review will provide examples of how the Turbiscan stability analyzer can be used for dispersion characterization and optimization throughout this industry.

Reminder on the technique

Turbiscan® technology, based on Static Multiple Light Scattering (SMLS), consists of sending light (at 880nm) into a sample and acquiring backscattered (BS) and transmitted (T) signal over the entire sample height. By repeating this measurement over time with adapted frequency, the instrument enables to monitor physical stability (coalescence, creaming, sedimentation, phase separation, etc...). The signal is directly linked to the particle concentration (ϕ) and size (d) by the Mie theory:



$$BS = f(\phi, d, np, nf)$$

Dispersion stability analysis

The Turbiscan® and Turbiscan® Stability Index (TSI) are 'must-have' tools for formulators for fast and quantitative formulation screening, rapid product development, and quantitative measurements of the stability. Turbiscan technology has been used for decades by formulators for stability measurements and is now recognized as a standard technique for direct stability analysis.