Formulaction

**TURBISCAN Classic**

**Application Note**
**AGROCHEMICAL**

# Effect of the Water Hardness on the Macroscopic Stability of a Formulation

## *INTRODUCTION*

The agrochemical products are complex and different preparations, in a solid or liquid form. The liquid formulations are characterised by the concentration and the solubility of active principles in the dispersion.
These kinds of preparation are used by pulverisation after diluting in water.


After the dilution, these formulations must be stable for a few hours independent of the temperature or the salts present in the water.

We have analysed, with the **Turbiscan Classic** the effect of salt concentration in water on the macroscopic stability (at high temperature) of three different herbicidal formulations. This will simulate various water hardnesses.

The water hardness is measured in °F, with 1°F being equivalent to 10ppm of calcium carbonate. A soft water is around 2°F and a hard one around 30°F.

## *SAMPLES PREPARATION AND EXPERIMENT PLAN*

Three dispersions containing pendimethalin (herbicidal agent) were analysed after diluting at 5% in water at different salts concentration :

- 20 ppm (equivalent to a 2°F water)
- 500 ppm (equivalent to a 50°F water)

| | | | | | |
|---|---|---|---|---|---|
| Sample number | : | 2 | Analysis temperature | : | 30°C |
| Analysis volume | : | 6 ml | Analysis duration | : | 16 hours |

Two hours are needed to bring the products to the required temperature (30°C).
The curve after two hours of analysis is selected as a reference : The subsequent traces show the evolution of back scattered light intensity (%, Y-axis) on the tube height (mm, X-axis) as a function of time (last curve in red).

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## *RESULTS*

The obtained spectrums show different kinds of back-scattering variation :

× a backscattering decrease in the middle of both samples (*Figure 1* and *2*), characteristic of globules coalescence phenomenon.

× a backscattering decrease at the top of both samples (*Figure 1* and *2*), significant of a clarification of the products in this zone.

× the backscattering variations at the samples bottom correspond to the formation of sediments non absorbents (backscattering increase as for Formula 1 + Water 20 ppm: *Figure 1*) or absorbents (backscattering decrease as for Formula 1 + Water 500 ppm: *Figure 2*).

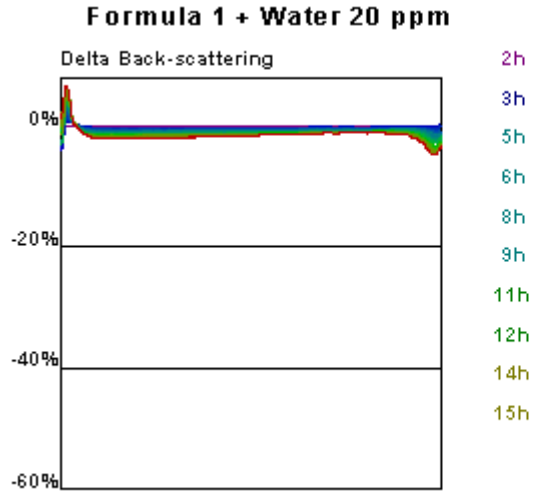

Figure 1

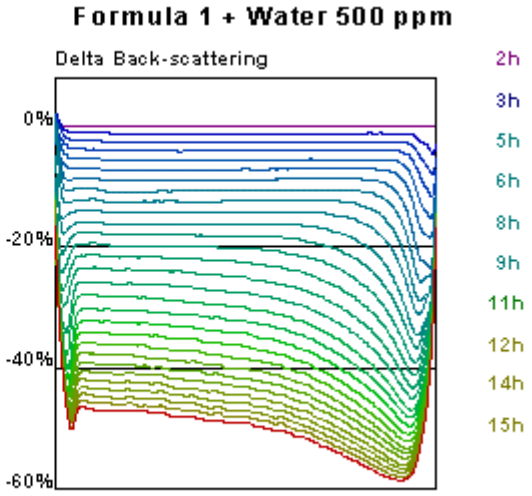

Figure 2

By plotting the backscattering variation in the middle of both samples as a function of time (*Figure 3*) it allows a quantitative comparison of the rate of particles coalescence.

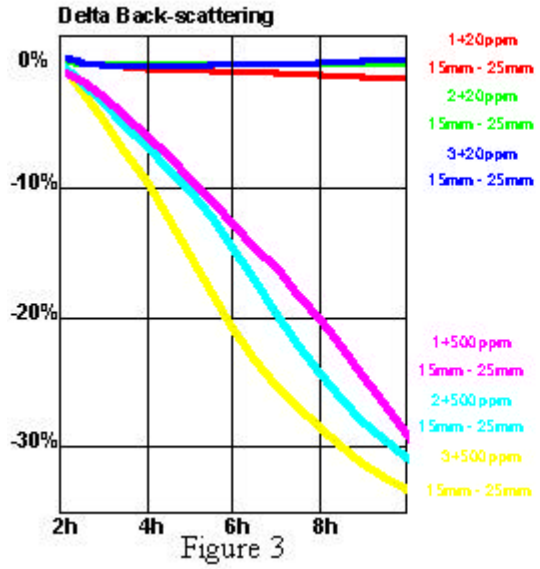

Figure 3

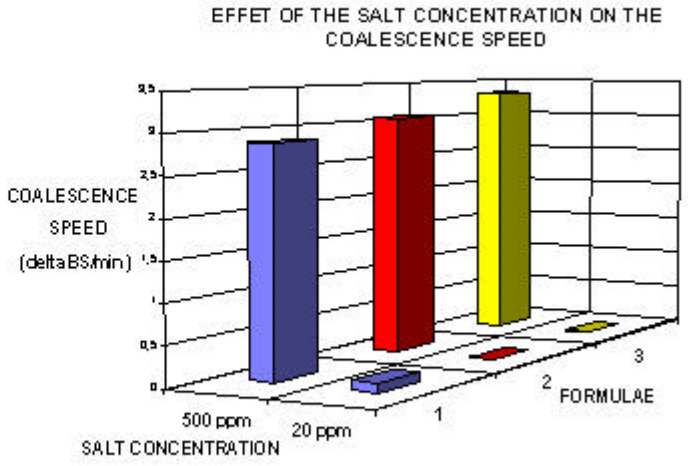

Figure 4

Calculation of the slope of the kinetics over 10 hours allows the determination of the rate of particles coalescence as a function of the salt concentration in water (*Figure 4*).

The formulation diluted in water at low salts concentration appear 3 time more stable than those diluted in water at high salt concentration. Therefore, the salts concentration in water determines the macroscopic stability of the products.

## *CONCLUSION*

**The Turbiscan Classic detects destabilisation phenomena in few minutes, and allows a quantitative comparison of the results to be made. It is a useful tool for the formulator who wants to study the stability of agrochemical formulations during their use.**