



Identification of the instability phenomenon of an emulsion

Done in collaboration with



Application

Cosmetics

Objective

Identify the phenomenon at the origin of the flocculation of an emulsion

Device

TURBISCAN® LAB

INTRODUCTION

Emulsions are unstable colloidal systems that undergo many destabilisation phenomena (coalescence, flocculation, creaming, etc.) that can be due to various causes (lack of surfactant to cover the interface, attractive forces, etc.). Therefore, it is very important for the formulator to know the origins of these processes to be able to overcome them to get a stable product.

One of the factor responsible for flocculation is the depletion due to the coexistence of small entities (micelles, microemulsions) and big droplets (emulsion). The latters undergo an osmotic pressure from the small ones that lead to a compression of the big drops. This depletion force is attractive and of low energy, hence it is reversible upon dilution.

METHOD

Experiments were carried out on an emulsion of hexadecane (10%) in water stabilized by various amounts of SDS (from 2 to 10 times the CMC).

RESULTS

1. Determination of depletion flocculation by various techniques

Macroscopic observation

Depletion flocculation gives rise to phase separation. This can be more or less easy to detect. Figure 1, we can observe in the right-hand tube, the coexistence of a cream and a less turbid phase. This phase separation is sometimes invisible to the naked eye.



Figure 1. SDS concentrations increase from left to right

Particle size analysis

Laser diffraction requires important dilution of the emulsion but enables to get the distribution size of the emulsion. On the other hand, it does not show flocculation in the emulsion if it is of low energy as for depletion flocculation (Figure 2).

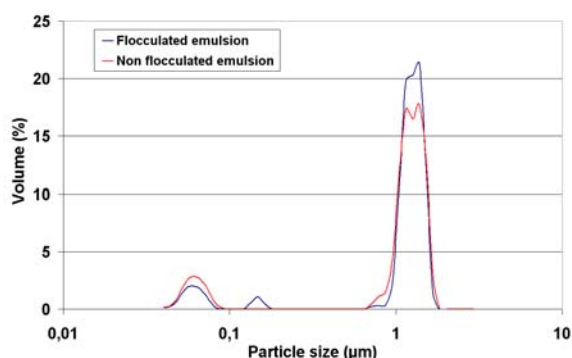


Figure 2. Particle size analysis of flocculated and non flocculated emulsion.