More than just a bottle by your sink!

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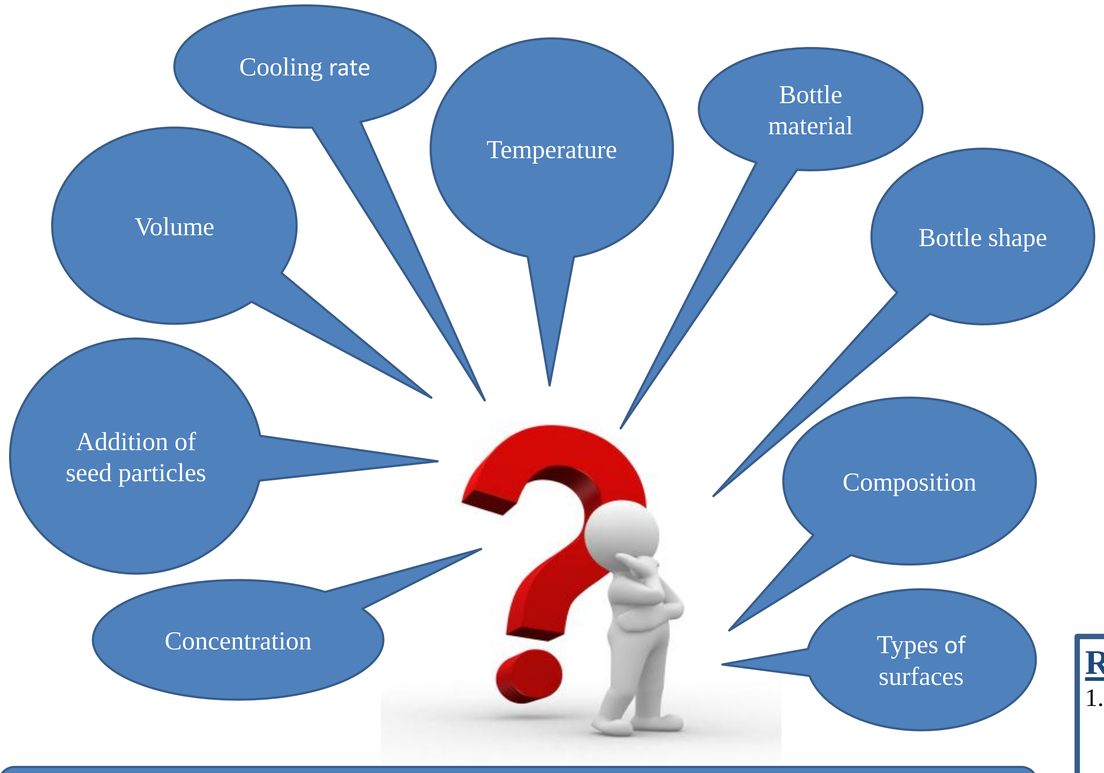
Introduction

- Homecare products are in demand all over the world. As such the formulations need to be able to withstand extreme weather, such as cold climates.
- As the temperature of a surfactant system (e.g. dish liquid) is lowered some precipitated crystals may be visualized, especially if the temperature is below the Krafft point of the surfactant system.

Aims and Objectives

- Use scientific techniques to study and monitor crystallisation of surfactant based formulations such as dish liquid and simple model systems.
- Consider how the factors below affect the rate and shape of crystallisation:



- Long term goal is to minimise the risk of crystallisation and subsequently improve profits and reduce waste.

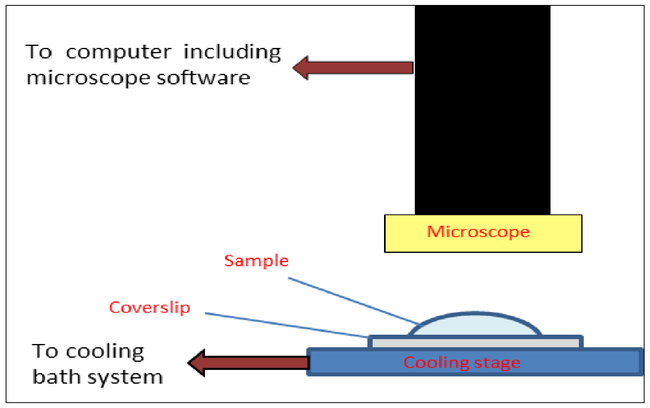
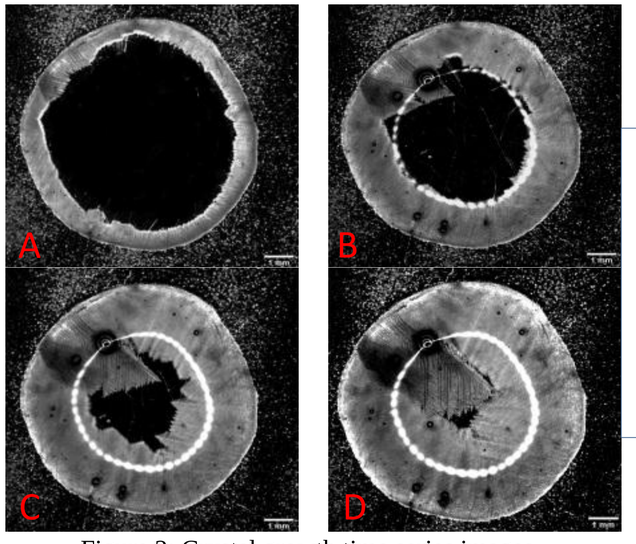


Figure 1: Experimental set up for microscopic crystal growth



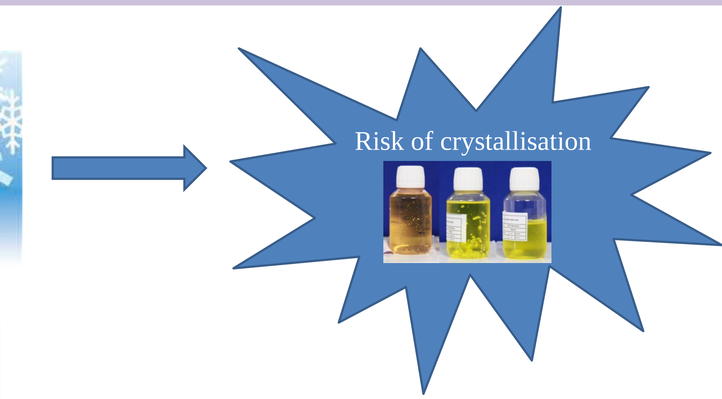
Time after droplet added (seconds):

A. 20
B. 40
C. 60
D. 80

Figure 2: Crystal growth time series images

References:

1. Amante, J.C., J.F. Scamehorn, and J.H. Harwell, *Precipitation of mixtures of anionic and cationic surfactants*. Journal of Colloid and Interface Science, 1991. **144**(1): p. 243-253.
2. Smith, L.A., et al., *Crystallisation of sodium dodecyl sulphate from aqueous solution: phase identification, crystal morphology, surface chemistry and kinetic interface roughening*. Journal of Crystal Growth, 2004. **263**(1-4): p. 480-490.



Initial Crystal Growth Study

Experimental Setup

- The following equipment (Figure 1) was utilised in order to expose a complex surfactant system to sub zero temperatures.
- At set intervals after crystallisation, images are acquired and used to analyse growth rate.

Observations

In drop systems, growth originates from the outer circumference. Two factors may be responsible for this observation:

1) Surface tension
2) Temperature differences

Next Steps

- Chemical and spectroscopic analysis on crystal surfactant structure and composition e.g. DSC, (cryo) SEM, Raman.
- Determine how the cooling rate affects microscopic crystal formation.