A Brief Description of the SAXS Analysis of Surfactant Mesophases at Morris Analytical X-ray Ltd Laboratories

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Abstract

Structured surfactant systems are used in a huge variety of applications (household, industrial & institutional, personal care, agrochemicals…)
A structured system is a pourable composition comprising water, surfactant and (usually) a structurant, which form a three-dimensional, lyotropic liquid-crystal matrix (properties change with changes in concentration).
The system has an internal yield stress, which is large enough to suspend solid particles, but is low enough to allow the system to flow as a normal liquid.

Surfactants are amphiphilic molecules, which can form lyotropic liquid crystals under controlled conditions. Amphiphilic molecules are composed of two different parts:
A non-polar, or hydrophobic, hydrocarbon tail that is insoluble in water, and a polar or hydrophilic head that tends to dissolve in water.

Some other amphiphilic molecules that form lyotropic liquid crystals are bile salts and phospholipids.

When these compounds are dissolved in water, they can form spherical aggregates such as micelles or vesicles (spherulites) or structures such as a bilayer.

What can SAXS tell us?

The phase or “crystal lattice” of the surfactant.
The size of the bilayer spacing.
We can use it to “tune” surfactant formulations.
The thermal stability of the system can easily be determined (in this case, over the temperature range 0-70℃).
The data can be incorporated into patents.

A brief description of this laboratory-based analysis will be given during the presentation, together with corresponding polarised light and SEM micrographs.