	Experiment title: Fast Self-assembly Kinetics of Photosensitive Surfactants	Experiment number: SC 2889
Beamline:	Date of experiment: from: 25.02.10 to: 01.03.10	Date of report: <i>Received at ESRF:</i>
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Report:

This work concerned the micellization and micellar dissolution kinetics of light-sensitive AzoTAB surfactant micelles. Upon light absorption, there is a change in the amphiphlicity brought upon the conformational transition from *cis* to *trans*-conformation. UV absorption favours *cis*-conformation and blue light: *trans* conformation. The micellization/dissolution of micelles was studied UB/blue light using as a trigger. A small report showing representative results from ID02 February 2010 follows. Here synchrotron SAXS coupled with a focused spectrophotometer was used to obtain structural resolution in the milli-second time range.

Figure 1 shows some obtained results of 4mg/mL AzoTab in 17% water/dimethylformamide (DMF) solvent mixture. The latter solvent composition was used in order to be close to the critical micelle concentration (cmc) and thus more sensitive to changes in the amphiphilic balance of the molecule. The data clearly shows the effect of the wavelength of light on the structure of the system. Before exposure, the scattering pattern clearly shows the presence of micelles. A model was developed for spherical core-shell micelles coexisting with dissolved

linear surfactants. Fits yield a radius of the core of about 18-19 Å while the shell was found to be about 7 Å thick. It was also found to be very close to cmc with only about 4 % of the amphiphiles aggregated into micelles. However upon UV exposure the micelles quickly dissolved as expected. Rather surprisingly, upon prolonged blue light exposure the micelles also exhibited a signature of dissolved surfactants. However analysing the time evolution after blue light exposure (not shown here), we observed a transient state of micelles which again was dissolved at longer times. After ex situ measurements of the temperature upon blue light illumination (temperature increase of several degrees) we attribute this to temperature-induced dissolution. The higher intensity must be attributed to change in the partial specific volume and hence the contrast.

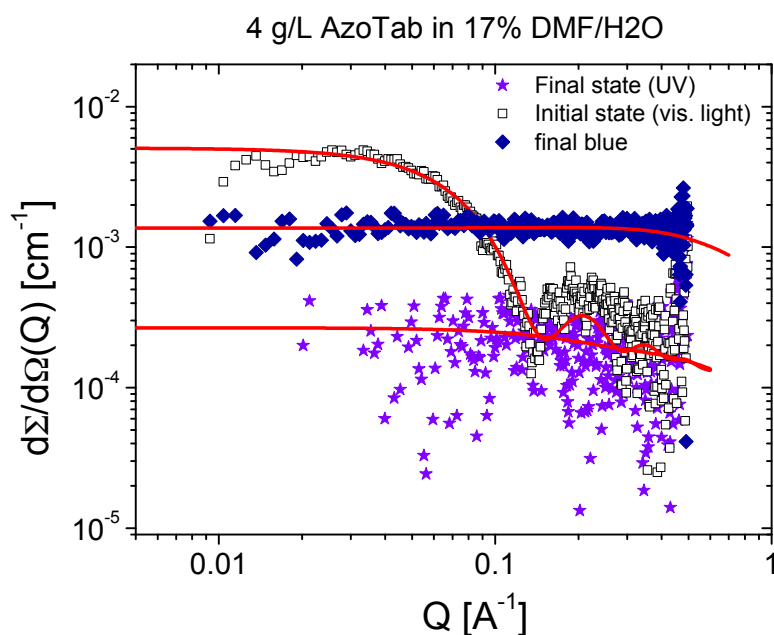


Figure 1. Effect of illumination on the structure of AzoTAB micelles

In contrast as shown in Figure 2 a), the time resolved SAXS curves obtained upon UV exposure show gradual dissolution of the micelles. Also as seen the data are rather noisy which is due to very low contrast in this solvent mixture. It should be mentioned that data obtained in pure water did not show significant dissolution kinetics. Corresponding data for the fraction of micelles are given in Figure 2 b).

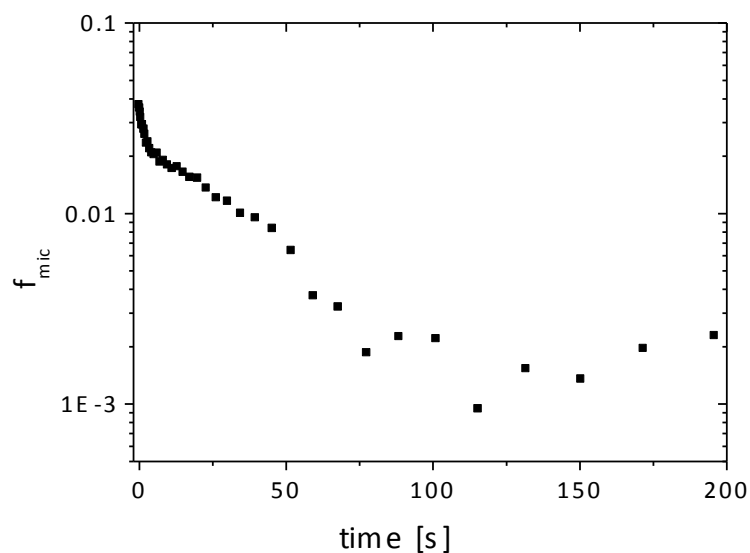
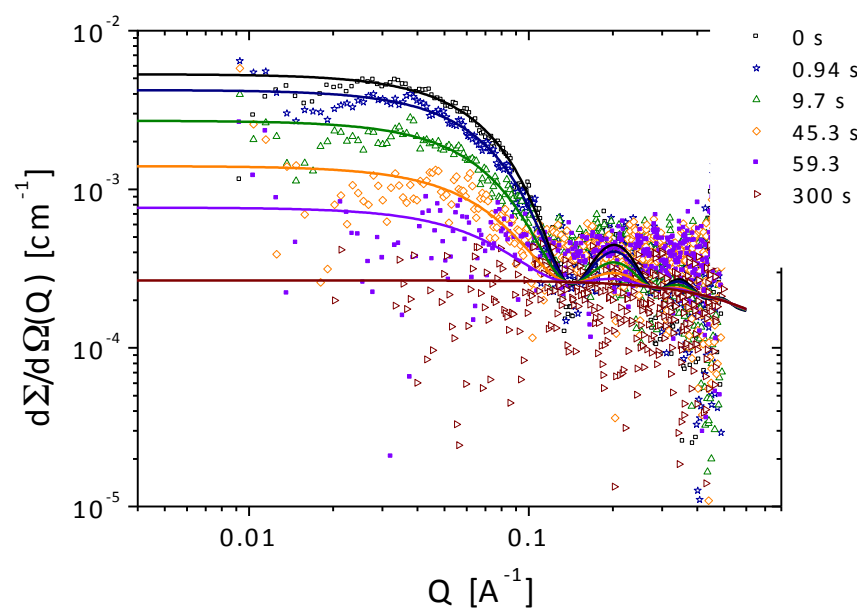


Figure 1. Kinetics after UV-exposure. Top: scattering data including fits using a model with a superposition of micelles and linear surfactants are shown as lines. The micelles were modelled using a polydisperse spherical core-shell model. Bottom: Extracted micellar fraction as a function of time.

The resulting micellar fraction seems to decay in a double exponential fashion. The kinetics and underlying kinetic pathways are currently being analysed and the results are being written up in a publication.