Determining measuring parameters and reference values

Product: SITA pro line t15+, SITA science line t100, (SITA DynoTester+)
Industries: Industrial parts cleaning, Electroplating
Measuring principle: Bubble pressure tensiometrie

A frequent measuring task for SITA tensiometers is the product or process control of liquids containing surfactants. To use the tensiometers for this purpose, you should first determine the **bubble lifetime measurement parameter** and **measure reference values** for the control task.

Parameter bubble lifetime

The optimal control bubble lifetime is the essential measurement parameter for measuring the dynamic surface tension. The following explains how to determine it.

1. **Reference sample solutions:** Set up reference solutions that show the surfactant concentration (target concentration) as well as ±50 % (both over- and underdosing). Add other components that are contained in the sample solution to consider possible interactions.
2. Determine the **relationship bubble lifetime - surface tension**: Analyse the dynamic surface tension of the samples at different bubble lifetimes (SITA DynoTester+) or in AUTO mode (SITA pro line t15+, SITA science line t100). Example: Measure the surface tension at 30 ms, 50 ms, 100 ms, 200 ms, 500 ms, 1 s, 2 s, (5 s, 10 s, 20 s).
3. Choose a bubble lifetime at which the resulting curves can be optimally differentiated. This is the control bubble lifetime for the surfactant control.

The following three diagrams show examples of two surfactants A and B, whereby A occurs in high and low concentrations.

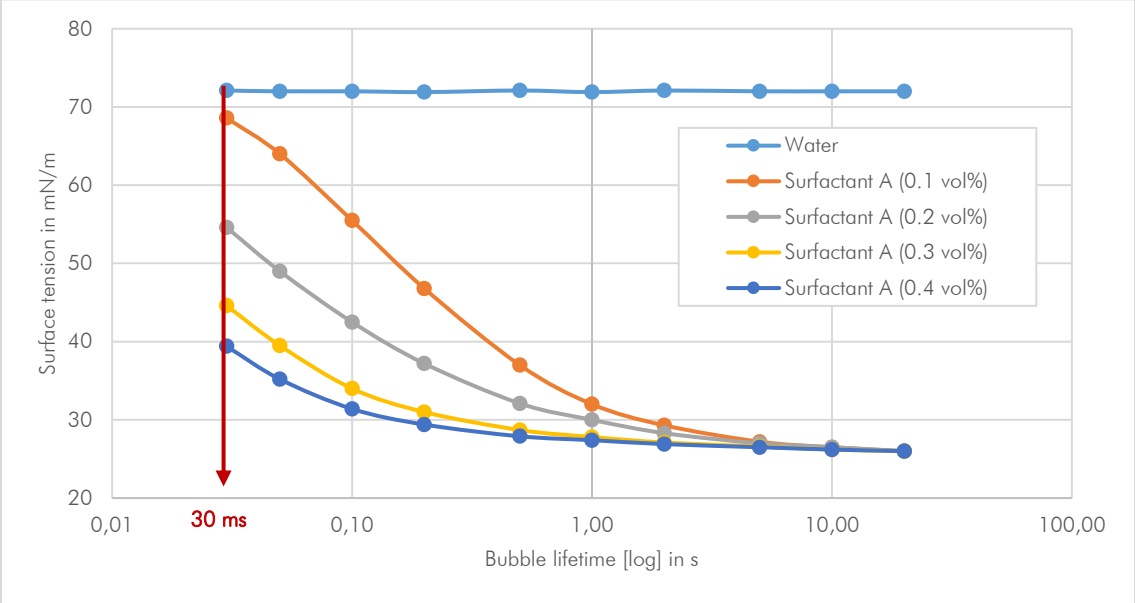

Diagram 1: Determine the relationship bubble lifetime - surface tension for the target concentration 0.2 vol%. Recommendation: 30 ms bubble lifetime

This diagram is typical for the highly concentrated active baths used in industrial cleaning.

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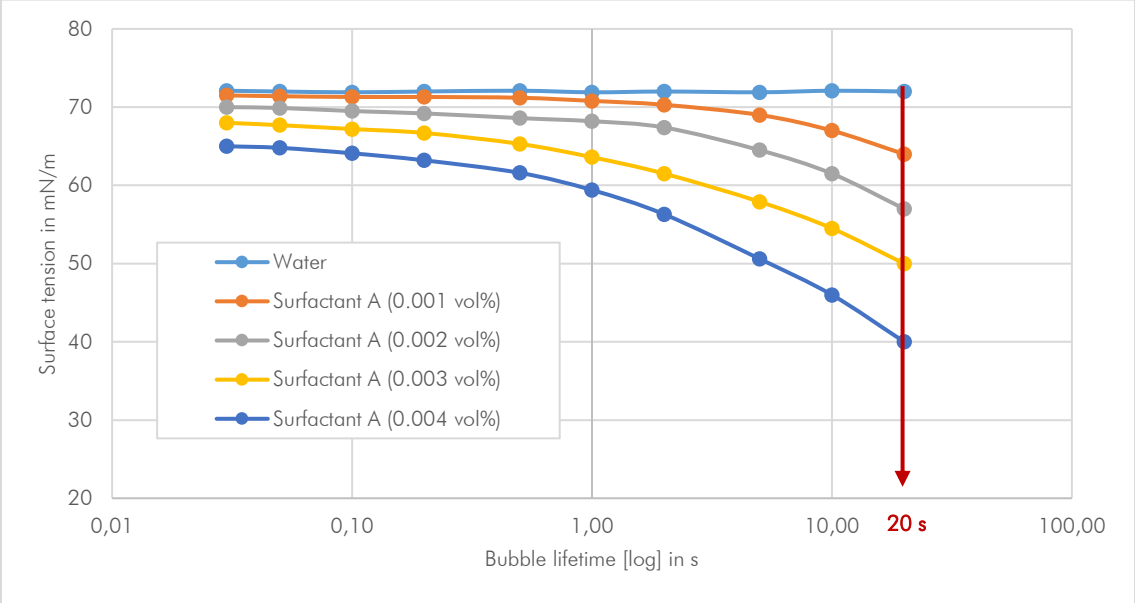

Diagram 2: Determine the relationship bubble lifetime - surface tension for the target concentration 0.003 vol%. Recommendation: 20 ss bubble lifetime.

This diagram is typical for low surfactant concentrations appearing for example in rinsing baths, into which the surfactant enters by carry-over.

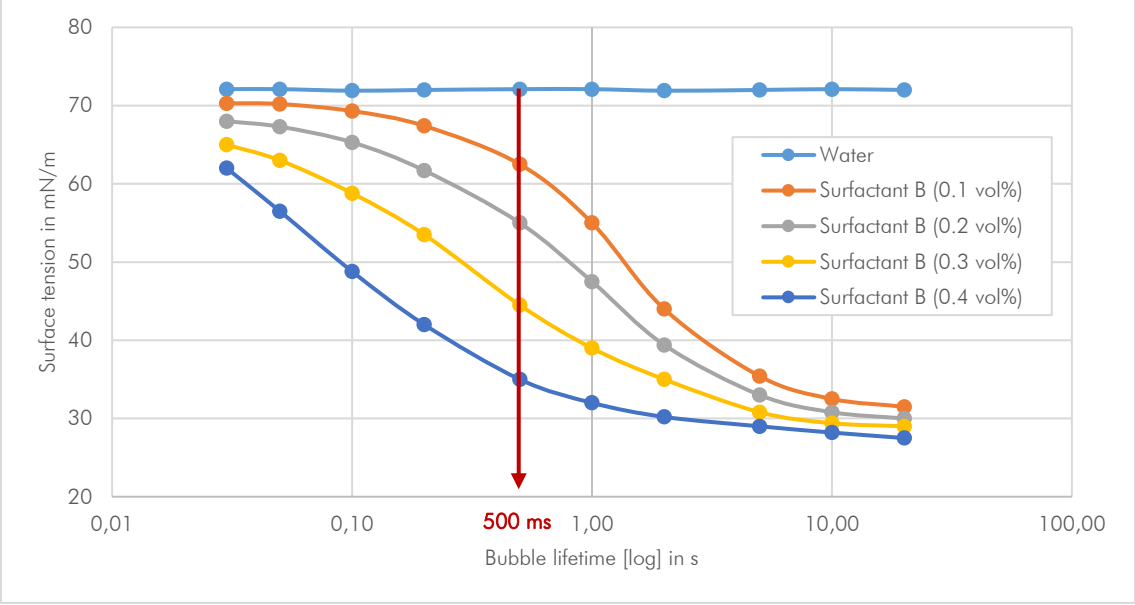

Diagram 3: Determine the relationship bubble lifetime - surface tension for the target concentration 0.3 vol%. Recommendation: 500 ms bubble lifetime.

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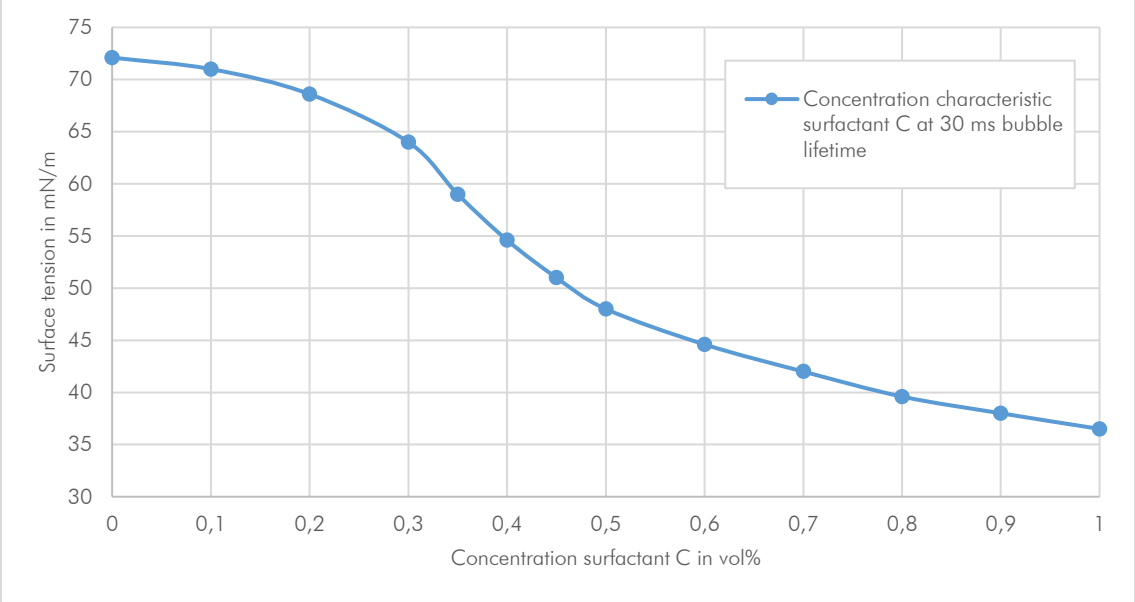
Determining reference values for control tasks

Using the bubble lifetime just found as a measurement parameter, now determine **reference values for the control task**.

1. Set up a dilution series in the range of the application concentration, which includes both over- and underdosing.
   Example: Application concentration: 0.5 vol%
   Dilution series: 0.1 / 0.2 / 0.3 (...) 0.9 / 1.0 vol%
2. Measure the samples at the bubble lifetime just determined. Observe the note on temperature!
3. If required, save the reference values as a concentration profile on the tensiometers *SITA DynoTester+* or *SITA science line t100* using the software *SITA ProcessLog* respectively *SITA LabSolution*.



Note 1: Temperature

The surface tension **depends on the temperature**. The sample temperature of the subsequent product or process control should correspond to the temperature at which the reference values were recorded. Often ±3 K are tolerable, at best check the dependence. We recommend room temperature for the measurement.

For non-ionic surfactants, note that the samples should be measured below the cloud point temperature.

Note 2: Dilution

Dilution may be useful if the measured surface tension of the samples is close to each other in the entire parametre range. The curves obtained are then hardly differentiable (the reproducibility of the method is 0.5 mN/m).

Try a dilution in deionised water (e.g. 1:10).

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