

New DIN/EN standard for determining anionic surfactants by means of potentiometric two-phase titration

The determination of the content of surface-active agents (surfactants) plays an important role in many sectors – from wastewater analysis up to quality control in production processes. A method that is still in widespread use is the so-called Epton titration according to ISO 2271, a complicated and time-consuming manual titration. The new DIN EN 14480 standard now describes an alternative determination method that is much simpler and faster: potentiometric two-phase titration.

Classical Epton titration – the appearance is deceptive!

In this manual titration the anionic surfactant is precipitated by a cationic surfactant in an Erlenmeyer flask containing a two-phase mixture of water and chloroform. The ion pair formed must be extracted into the solvent phase by vigorous shaking. The titration endpoint is then determined visually using a color indicator. This method is not only complicated, it also suffers from the following serious disadvantages:

- Use of the toxic solvent chloroform
- Very time-consuming determination as after each titrant addition a waiting period for phase separation is required
- Inaccurate visual endpoint recognition
- Cannot be automated

Potentiometric two-phase titration according to DIN EN 14480: more precise, faster and much healthier!

The solution of the anionic surfactant is pipetted into a titration vessel, to which a two-phase mixture of water and methyl isobutyl ketone/ethanol 1 : 1 and an emulsifier are added. Under vigorous stirring the emulsion formed is titrated with a cationic surfactant, in this case benzethonium chloride (Hyamine 1622). The ion pair formed, which is insoluble in water, is extracted immediately into the organic phase. The determination of the equivalence point does not take place visually, but potentiometrically using surfactant-sensitive electrodes. The Surfactrodes from Metrohm (Surfactrode Resistant or Surfactrode Refill, see photo at right) are used for this purpose; they have a high affinity for surface-active agents. In comparison with the Epton titration you profit from the following advantages:

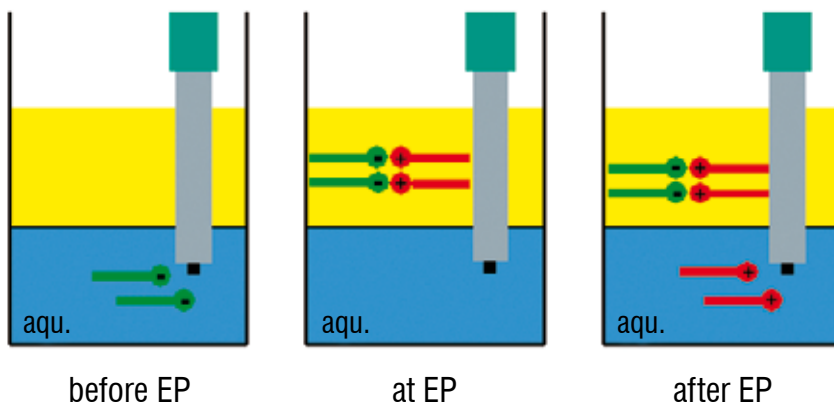
- Use of unproblematic solvents instead of chloroform
- Short determination times: only a few minutes per titration
- Objective, computer-supported determination of the equivalence point and therefore improved precision
- Can easily be automated

In an extensive Europe-wide interlaboratory test the potentiometric two-phase titration was compared with the Epton method and was found to yield the same analytical results with a better repeatability. A detailed evaluation of the interlaboratory test can be found in the appendix of DIN EN 14480.



The Metrohm Surfactrodes for potentiometric two-phase titration: 6.0507.130 Surfactrode Resistant (right) and 6.0507.140 Surfactrode Refill with paste and filling tool.

Schematic diagram of the potentiometric two-phase titration of an anionic surfactant (EP = equivalence point).



Example of a curve for the potentiometric two-phase titration of an anionic surfactant. The equivalence point is determined by the titrator and is therefore considerably more precise than the visual determination of the titration endpoint.

Sample: anionic wetting agent
Electrode: Surfctrode Refill
Titrant: c(Hyamime 1622) = 0.005 mol/L



It's time to change over!

With the potentiometric two-phase titration, DIN EN 14480 describes a simple, precise and environmentally compatible method for determining anionic surfactants. A similar DIN/EN standard for the determination of cationic surfactants will appear shortly.

Can it also be done without any solvents?

Surfactants can often also be titrated in a purely aqueous medium. A quick test shows if this is possible: Dissolve some sample in pH = 3, pH = 7 and pH = 10 buffers and add the titrant. If a precipitate forms in one of the buffers then the sample can be titrated at this pH value.

Metrohm is the market leader in the field of surfactant titration and is therefore your competent partner. Not only do we offer you all the necessary instruments and accessories, you can also profit from our wealth of experience in this sector. Our «Surf PAC», a comprehensive collection of application examples and methods for the titration of anionic, cationic and non-ionic surfactants, makes getting involved in surfactant analysis child's play.