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Application News

No. SCA-130-204

Sum parameter – Total Organic Carbon

TOC-Determination according to EP 2.2.44

Since the USP (United States Pharmacopoeia) regulations for the determination of Aqua Purificata and Aqua ad injectabilia has been implemented into the European Pharmacopoeia (EP), TOC analysis has become increasingly established in quality control. Users who test the TOC content in pharmaceutical water must regularly test their TOC system using a system suitability test according to the method described in the EP 2.2.44 guidelines.

■ European Pharmacopeia

The EP 2.2.44 guidelines do not prescribe any particular oxidation technique for TOC determination. The TOC systems, however, must be able to differentiate between inorganic and organic carbon. This can be carried out either via removal of the inorganic carbon (NPOC method), or via a separate determination (difference method). The limit of detection for TOC should be at least 0.05 mg /L. The applicability of the method must be determined via a system suitability test.

■ System suitability test

For the system suitability test, a standard sucrose solution with a carbon content of 0.5 mg/L is prepared. A control solution of 1,4-benzoquinone with the same carbon content was subsequently prepared. The blank water (ultra-pure water) used for this purpose may not exceed a TOC content of 0.1 mg/L. For the system suitability test, all solutions including the blank water are subsequently measured and the resulting signals are recorded.

Blank water: r_w
Standard solution (sucrose): r_s
Control solution (benzoquinone): r_{ss}

The peak area of the blank water is subtracted from the peak areas of both standard solutions. The recovery of the benzoquinone standard is then calculated with respect to the sucrose standard.

Recovery in %: $$\frac{r_{ss} - r_w}{r_s - r_w} \times 100$$

Results between 85 - 115% are acceptable. The ultrapure water sample corresponds to the guidelines when its response signal (r_u) does not exceed $r_s - r_w$.

■ TOC-Control L software

The TOC-Control L software simplifies the implementation of the system suitability tests using integrated templates for the creation of calibration curves and the measurement of the control sample.

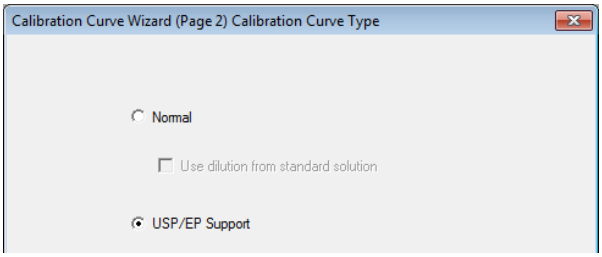

Fig. Calibration curve wizard

The following figure shows an example of an EP calibration curve (2 points, blank and 500 µg/L).

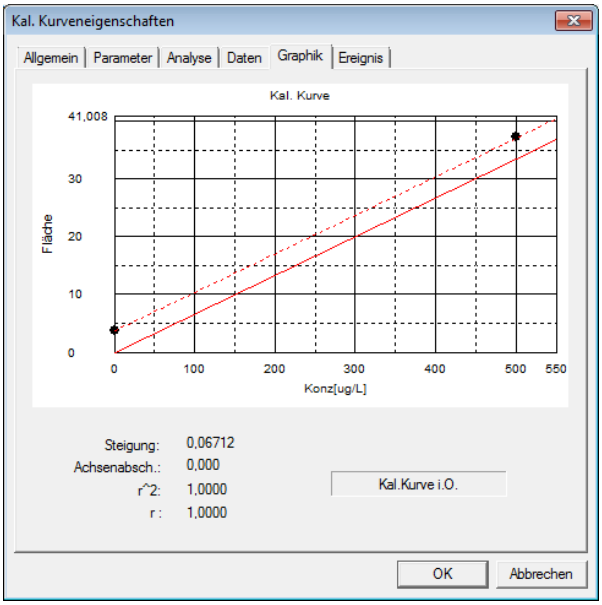

Fig. Calibration Curve

The determination of benzoquinone is set in the sample / method properties wizard.

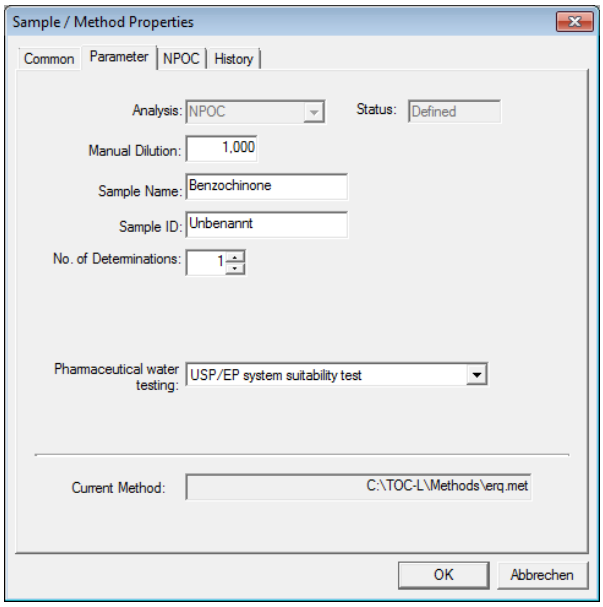

Fig. Benzochinone-Determination

After measuring the benzoquinone sample, the software automatically calculates the recovery according to EP 2.2.44, whereby the peak area values for the blank sample and the sucrose sample are obtained from the calibration curve. The result is listed under the column 'Notes' in the sample table (Figure below).

Washing / Untitled
NPOC:0,000mg/L

	Typ	Analyse	Probenname	Original	Ergebnis	Notizen
15	Unbekannt	NPOC	Washing		NPOC:0,000mg/L	
16	Unbekannt	NPOC	Washing		NPOC:0,000mg/L	
17	Standard	NPOC	Untitled	npoc_sucrose_500ppb.2012_02_03_13_37_01.cal		
18	Unbekannt	NPOC	Benzochinon	npoc_sucrose_500ppb.cal	NPOC:592,7ug/L	107.5% : USP/EP system suitability test: Pass
19	Unbekannt	NPOC	Washing		NPOC:0,000mg/L	

Fig. Result of system suitability test in sample table

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