

# DATA BULLETIN

## *Conducting the cellulose test with the enviro TOC*

In compliance with several liquid TOC standards (e.g., ISO 8245 (Annex B), DIN EN 1484 (Annex C), or ES 04311.1c), the suitability of a TOC analyzer for the analysis of particle-containing samples is tested with a suspension of cellulose. For the cellulose test, 225 mg of cellulose are placed in 1 l of water, which results in a carbon concentration of 100 mg/l. This test suspension is then stirred with a magnetic stirrer until the suspension is homogeneous. Ultrasonic treatment should not be used because it reduces the particle size. The average of a triplicate measurement is required to be between 90 mg/l and 110 mg/l, the repeatability variation coefficient should be < 10 %.

The analysis of a cellulose solution as a test substance for particle-containing samples has been performed with different enviro TOC instruments by using the particle method with different injection volumes. The particle methods for all carbon species (NPOC, TC, TIC) avoid sedimentation of the sample before injection as the sample is automatically stirred and the range of the injection volume is pre-defined between 0.1 and 0.25 ml.

When using an autosampler, it is important that the samples are not on the autosampler for a too long time before stirring starts. Otherwise, the cellulose could agglutinate again. Without an autosampler, the cellulose sample is either continuously stirred at the position for the sample container or an external stirrer needs to be used if a larger sample container is required.

The results of the cellulose test for the enviro TOC system are within the required range for all samples and are summarized in the following table:

### INSTRUMENT:

enviro TOC

### DETAILS:

method: TC / NPOC particle

sample: 100 ppm TOC cellulose suspension



METHOD	n	INJECTION VOLUME [ml]	AVERAGE [ppm]	TARGET [ppm]	RSD [%]	TARGET [RSD %]
TC PARTICLE	30	0.1	103	90-110	4.6	10
TC PARTICLE	30	0.15	103	90-110	5.3	10
TC PARTICLE	30	0.2	97	90-110	4.9	10

In addition to a sample injection without sedimentation, large tube diameters (the smallest diameter in the enviro TOC is 0.8 mm), a stable flow, strong combustion and a detector covering a wide measurement range are important features to process cellulose or particle-containing samples in general and get excellent results. The cellulose peak is very sharp, indicating that combustion (temperature of 850 °C) and flow (175 ml/min) are well defined for this application. The high resolution of the detector and the lyticOS® software make the evaluation of the samples simple and well-understandable.

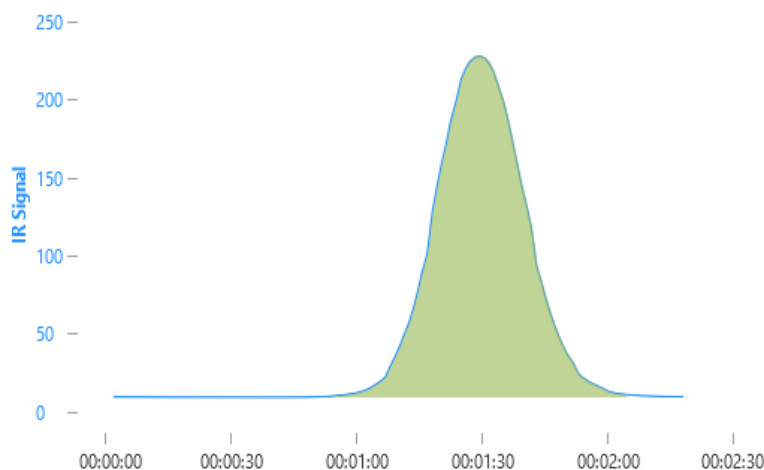


Figure: Typical 100 ppm TOC cellulose peak achieved with the NPOC particle method and 0.1 ml injection volume.

## Summary

Independently from the injection volume, the recovery of all cellulose samples is clearly within the required limits of the international standards (~factor 2 for the RSD and ~7 % buffer for the accuracy) which demonstrates the suitability of the analyzer for particle-containing samples. In addition, the cellulose peaks are very sharp, and the analysis time is less than 2.5 minutes, illustrating that the instrument is indeed customized for these kind of samples. The residues of the sample combustion during the analyses are trapped in the SALTRAP, which protects the combustion tube not only from salts, but also from particle effects, thus extending its lifetime. Consequently, the enviro TOC approach meets all expectations to an analyzer for TOC analysis in particle-containing samples.

### Elementar – your partner for excellent elemental analysis

Elementar is the world leader in high performance analysis of organic and inorganic elements. Continuous innovation, creative solutions and comprehensive support form the foundation of the Elementar brand, ensuring our products continue to advance science across agriculture, chemical, environmental, energy, materials and forensics markets in more than 80 countries.

#### Elementar Analysensysteme GmbH

Elementar-Straße 1 · 63505 Langenselbold (Germany)

Phone: +49 (0) 6184 9393-0 | [info@elementar.com](mailto:info@elementar.com) | [www.elementar.com](http://www.elementar.com)

