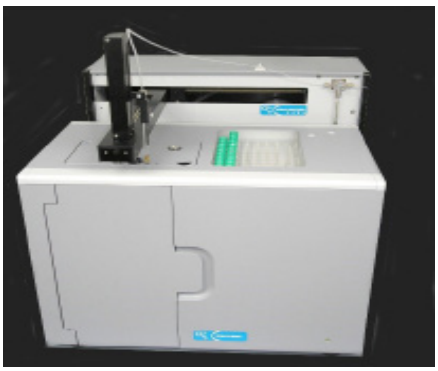
sercon
innovators in isotopes

Application note 001

TOC-IRMS – An Established Technique

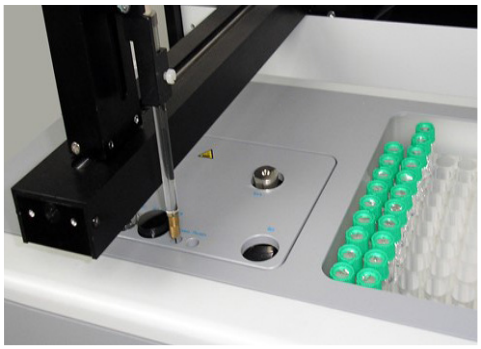
The requirement for more robust, user friendly TOC systems that permit the analysis of both fresh and salt water samples has led to the development of the Sercon TOC-IRMS interface.

Based around the Sercon Cryoprep which is used primarily for the analysis of atmospheric gases (CO_2, N_2O, CH_4, N_2 and O_2) and the Sercon 20-22 IRMS it is now possible to use TOC analysers that implement sample combustion rather than the restrictive persulphate oxidation method.



By utilising methods of cryotrappying and flow modification, it has been demonstrated that the system is capable of measuring small (sub 1ml) sample volumes and analysing DOC concentrations from 0.5 to 10ppm at levels of high precision (typically 0.1‰ for $^{13}CO_2$ determinations).

This high performance system is ideally suited to environmental monitoring laboratories where there is a need for a standalone TOC and biogenic trace gas measurements and lends itself to interfacing with the majority of commercially available TOC instruments.



Sercon have developed a technique for isotopic analysis of TOC and TIC that is both precise and accurate on low volume samples. It is suitable for freshwaater, brackish and seawater samples. The flexibility of the Sercon Cryoprep and 20-22 IRMS make it an important tool for any environmental monitoring laboratory.

info@sercongroup.com
www.sercongroup.com

Example data set, produced by interacing with Thermalox TOC-TN SYSTEM. Injection volumes of 160µl, concentrations of 10ppm to 0.5ppm carbon with precision better than SD ± 0.2‰

Performance Data Sets

Precision 10ppm 160µl Injection

1	qc	100	1.06E-07		-32.69535	
2	CO2 TOC_CRYO	100	1.07E-07	10	-28.29997	
3	10	100	1.06E-07	9.87	-28.37007	
4	10	100	1.07E-07	9.99	-28.38265	**Mean**
5	10	100	1.09E-07	10.15	-28.43677	-28.43441
6	10	100	1.09E-07	10.1	-28.56892	**SD**
7	10	100	1.10E-07	10.19	-28.35215	0.08421729
8	10	100	1.09E-07	10.16	-28.49587	
9	CO2 TOC_CRYO	100	1.08E-07	10	-28.29997	

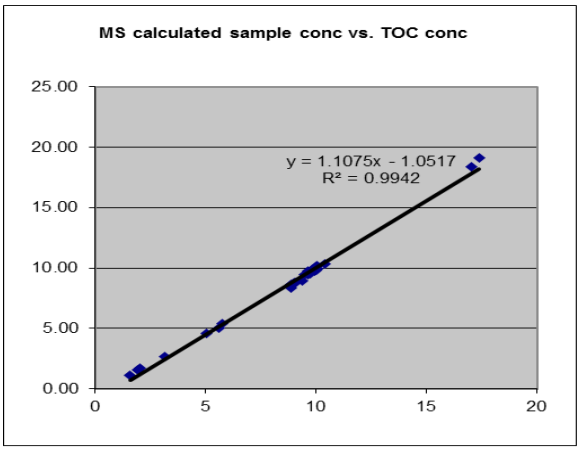
Precision 0.5ppm 300µl Injection

1	b	100	1.36E-08	59.64797	-25.706	
2	CO2 TOC_CRYO	100	1.26E-08	99.99999	-28.29997	
3	b1	100	9.22E-09	75.45179	-30.19208	
4	b2	100	1.22E-08	101.5057	-28.77736	**Mean**
5	b3	100	1.23E-08	104.4089	-29.44613	-29.47137
6	b4	100	1.21E-08	104.2584	-29.45056	**SD**
7	b5	100	1.25E-08	108.8192	-29.46501	0.44784954
8	b6	100	1.30E-08	114.8732	-29.4971	
9	CO2 TOC_CRYO	100	1.11E-08	99.99999	-28.29997	

Synthetic Seawater with sucrose spike 10ppm 160µl Injection

1	SW	100	3.98E-07	97.1289	-0.3834	
2	CO2 TOC_CRYO	100	4.14E-07	100	-0.0003	
3	SW	100	4.29E-07	102.4143	-0.0295	**Mean**
4	SW	100	4.36E-07	103.145	0.0606	-0.3970
5	SW	100	4.42E-07	103.4457	-0.9576	**SD**
6	SW	100	4.40E-07	101.9358	-0.9314	0.5042
7	SW	100	4.46E-07	100.4063	-0.1274	
8	CO2 TOC_CRYO	100	4.49E-07	100	-0.0003	

Plot demonstrating 100% sample transfer



De Troyer, I., Bouillon, S., Barker, S., Perry, C., Coorevits, K., & Merckx, R. (2010). Stable isotope analysis of dissolved organic carbon in soil solutions using a catalytic combustion total organic carbon analyzer-isotope ratio mass spectrometer with a cryofocusing interface. Rapid Communications in Mass Spectrometry, 24, 365-374.

info@sercongroup.com
www.sercongroup.com