A precise, accurate and fast determination method of $\delta^{13}C$ value in dissolved organic carbon using gas chromatography combined with an isotope ratio mass spectrometry

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Here we present a precise, accurate and fast determination method of $\delta^{13}C$ value in dissolved organic carbon ($\delta^{13}C_{DOC}$) based on wet-oxidation [1] and gas chromatography-combustion-isotope ratio mass spectrometry (GC-C-IRMS).

Two standard solutions, potassium acid phthalate (KHP) and sucrose (SUC), with concentration from 5 mg/L to 30 mg/L were analyzed by this method. Within each run, 3 ml sample and 9 min were needed for GC-C-IRMS. The results showed a precision <0.2‰ and were accurate enough compared with that determined by an elemental analyzer coupled to IRMS [2] (table 1).

	GC-C-IRMS	EA-IRMS
KHP	-28.0±0.15‰	-27.9±0.19‰
SUC	-12.2±0.20‰	-12.0±0.11‰

Table 1: Comparison of $\delta^{13}C_{DOC}$ values by GC-C-IRMS and by EA-IRMS.

A series of KHP solutions with concentration from 1 mg/L to 30 mg/L were also determined to build a standard curve by which the DOC concentration of an unknown sample could be obtained. The sample concentration and peak area were fitted well in the double logarithm coordinate (R^2=0.998) and the relative errors were lower than ±20% within a single run.

Conclusively, this high-efficiency method could determine the $\delta^{13}C_{DOC}$ precisely and accurately. Additionally, it is applicable for more isotope laboratories all over the world since the GC-C-IRMS system has been commercialized for many decades.

[1] Lang *et al* (2012), *Rapid Communications in Mass Spectrometry* **26**, 9-16. [2] Gandhi *et al* (2004), Rapid *Communications in Mass Spectrometry* **18**, 903-906.