

Micro-Combustion Module™ (MCM): Elimination of Organic Interferences

PICARRO



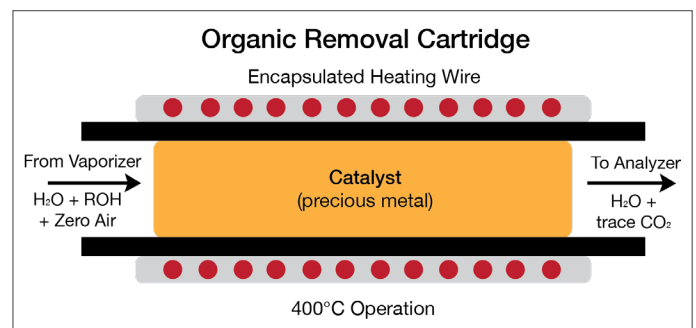
- Remove organic interference in water stable isotope analysis using proprietary catalytic oxidation process
- Ideal for plant water and other organic-contaminated water analysis
- Complementary to ChemCorrect: organic contamination identification software
- Fully-integrated into Picarro vaporizer, A0211 and water analyzer, L21x0-*i* for seamless operation

The **A0214 Micro-Combustion Module (MCM)** is Picarro's breakthrough technology that, for the first time, allows scientists to eliminate organic interferences from water isotope analysis in a fully in-line process integrated with sample vaporization and isotope ratio measurements. Installed between the water vaporizer (Picarro A0211) and any L21x0-*i* series Picarro water isotope analyzer, the MCM provides seamless operation.

Interferences from organic molecules can compromise isotopic measurements. Certain organics, including some of those found in plant water, can shift the baseline of the water spectral curve or have their own spectral features that overlap with water characteristics resulting in deviation of the δD , $\delta^{18}O$ or $\delta^{17}O$ isotopic reading.

The MCM consists of a micro-reactor containing a heating element and a proprietary catalyst. The gaseous sample from the vaporizer passes through the reactor and a catalytic oxidation process efficiently converts the organics in the gaseous phase into minute quantities of carbon dioxide and nascent water. The unique design operates with very low power requirements making it suitable for field deployments.

The MCM has shown to effectively remove spectral interference for commonly occurring alcohols and plant products including multicomponent mixtures of alcohols, terpenes, and green leaf volatiles. It has optimal efficacy for samples containing total organics in concentrations typical for many plant extracts (< 0.35%) due to the production of nascent water. Higher concentrations of alcohols, such as those found in certain beverages, will not be completely broken down in the MCM. However, the process is highly reproducible and can create high-precision fingerprint data.



Schematic of the organic oxidation process that occurs within the oxidation cartridge consisting of a quartz tube wrapped with a heating element and filled with the catalytic material. The oxidation reaction converts entrained organic present in the water vapor into H_2O and CO_2 .

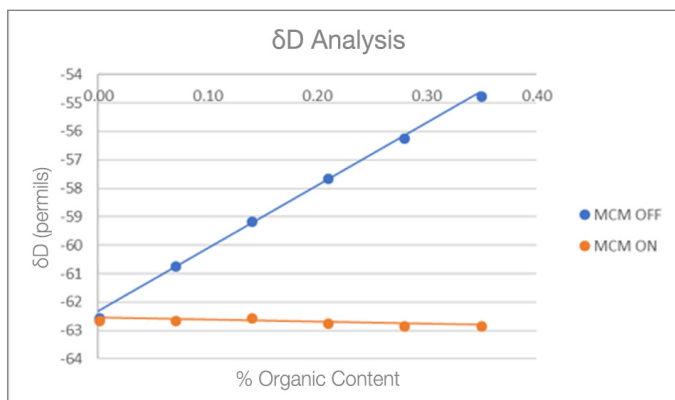
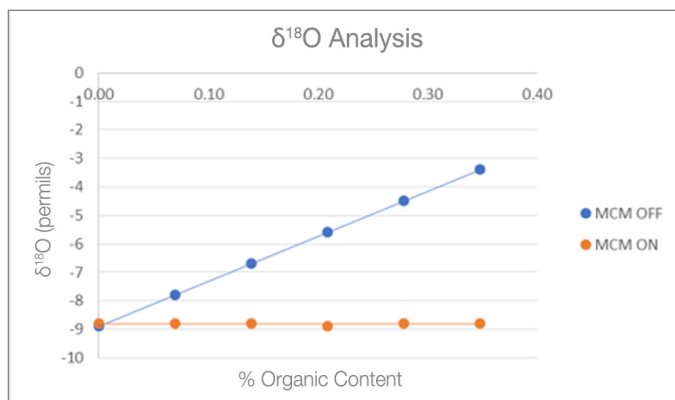
A0214 MCM Performance Specifications

3 Modes	<p>ON: Actively removing organics. Cartridge is operating at optimal power.</p> <p>WARM: Cartridge is operating at low power to prevent condensation and fractionation. Not actively removing organics.</p> <p>OFF: Cartridge is cold, lifetime is longest. Although our testing shows no condensation or fractionation, user should confirm with standards.</p>
Performance on Clean Water Sample	Analyzer guaranteed precision and drift are maintained whether MCM in ON, WARM, or OFF mode.
Measurement Uncertainty on Plant Water Extract (<0.35% organics)	<0.2‰ and <1.5‰ for $\delta^{18}\text{O}$ and δD^*

* within limits for hydrological applications set by the IAEA in their 2016 WICO proficiency test

A0214 MCM System Specifications

Installation	Mounts on Vaporizer, A0211. Retrofittable and user-installable (Consult Picarro)
Gas Carrier	Zero Air
Connections	1/4" Swagelok®
Communication	USB to L21x0-i
Dimensions	7" w x 6.5" d x 2" h (17.8 x 16.5 x 5 cm)
Weight	1 lbs (0.5kg)
Power Requirement	90–240 VAC, 50/60Hz, <30W
Consumable	C0345, Organic Oxidation Cartridge
Cartridge Expected Lifetime	4 months in ON mode when analyzing plant water extract



Six samples were prepared by further diluting the synthetic plant solution with the same DI water creating organic solutions ranging from 0% to 0.348%. These samples were analyzed on the Picarro water analyzer that included the MCM, and were analyzed with the MCM ON to oxidize the organic contaminants and with the MCM OFF (no oxidation).