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Our proposed new application of solid phase extraction (SPE) to remove methanol (MeOH) & ethanol (EtOH) from plant water extracts for enhanced isotope ratio infrared spectroscopy (IRIS).

• EtOH & MeOH cause baseline shifts in the wavelength region H₂O isotopologues are studied at.
• SPE with carbonyl (C-18) adsorbents bind to the non-polar heads of EtOH/MeOH, allowing the polar water molecules to pass through.
• SPE is compared to (1) activated charcoal adsorption & (2) a pre-combustion technique in the form of Picarro Inc.’s Micro-Combustion Module (MCM).

1. Introduction

2. Methods

SPE is prepared by the following steps:
• Conditioning: with 7.0 mL EtOH to prepare SPE chemical environment.
• Equilibrating: with 30.0 mL H₂O to release excess EtOH before loading.
• Loading: with contaminated water in a drop-wise release rate.

3. Results

4. Comparison with MCM

Pre-MCM:

Post-MCM:

5. Conclusions

• SPE removes the most organics, eliminating all spectral interference for naturally occurring [MeOH] ≤ 0.08%, [EtOH] ≤ 2.9% (within ±0.28‰ for δ¹⁸O & ±1.40‰ for δD).
• EtOH/MeOH & δ isotope values have strong negative correlation (p < 0.001).
• SPE treatment removes correlation for EtOH (p = 0.51), but does not remove correlation for MeOH (p < 0.01).
• SPE removes 86.7% EtOH & 78.8% MeOH. Despite similar removal amounts, MeOH is a more potent contaminant than EtOH, making SPE less effective for MeOH.

• Activated charcoal showed minimal alcohol removal.
• The MCM applies for alcohol concentrations ≤0.5%. EtOH can naturally exist in significantly higher concentrations.

Proposed Solution:
• Incorporate an SPE step prior to the MCM stage so that the ≤0.5% concentration limit can be met. This ensures the most effective removal of both MeOH & EtOH in natural samples.

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7. References