

In line Nafion-based water gas remover for In Situ Mass Spectrometry

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For over a decade membrane inlet mass spectrometer (MIMS) have been adapted to quantify in situ the dissolved gases in sea water at a great variety of depth (eg. Short et al, Meas. Sci. technol, 1999). Polydimethylsiloxane (PDMS) membrane are widely used because of the variety of gases permeating through it. The amount of water gas permeating through PDMS is however rather high. Higher pumping rate and decrease in instrument sensitivity result from the high water partial pressure. Cold traps have been used to cope with this problem (Schülter and Gentz, J. of Am. Soc. Mass. Spec., 2008), but are impractical/high power demanding for long term in situ mass spectrometer (MS) deployment. Molecular sieve is efficient in binding water, even in vacuum, but binds hydrogen sulfide as well. We therefore developed a drying module based on molecular sieve beads in a vacuum chamber. The gas sample coming from the membrane inlet passes through the chamber in a nafion tubing before entering the ionization chamber of the MS. This module achieves a 5 time reduction in the water partial pressure, without reducing the other gases partial pressure. The system sustained its performance for about 4 days of continuous use before the water removal efficiency decreased. Backing off the module proved to restore the water removal efficiency. In addition, the hysteresis of the other gas signals observed when pressure cycling the inlet (a known problem with PDMS membrane) appears to be reduced by the use of the drying module.