



TECH TO BUSINESS

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Passive Diffusion Dissolved Gas Sampler for Groundwater

TECH ID #: 694.1

Background

The Passive Diffusion Dissolved Gas Sampler is a new device, method and system for the quantitative measurement of dissolved gases present in groundwater. The design allows for the collection of a gas sample from a desired depth under in situ conditions. Dissolved gases are isolated within the sampler and can be directly injected into a gas chromatograph for analysis. The ability to directly inject the gas from the collection chamber prevents potential degassing or contamination from atmospheric sources.

Dissolved gases play a major role in the chemical evolution of groundwater and global geochemical cycles. Thus, the quantitative measurement of dissolved gases in groundwater can provide insight into transport and biogeochemical processes in aquifers. Despite their value, dissolved gases are often underutilized in geochemical investigations, largely because sampling is often onerous and sample integrity can be compromised.

The most commonly used sampling protocol involves pumping groundwater into a vial followed by headspace partitioning and gas chromatographic analysis of the headspace. However, during this method, sample degassing inevitably occurs and atmospheric contact can lead to sample contamination. The Passive Diffusion Dissolved Gas Sampler avoids atmospheric contact thus providing an accurate gas sample for analysis.

Areas of Application

- Geochemical exploration
- Seismology
- Paleoclimatology – age-dating of young groundwater, groundwater tracers
- Monitoring volatile organic contaminants
- Remediation – Monitored natural attenuation is becoming an increasingly popular strategy at oil and gas impacted sites in order to demonstrate to regulators that sufficient biodegradation of contaminants is occurring



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Competitive Advantages

- Eliminates the need for headspace partitioning in the lab
- Increases accuracy since absolute gas concentrations can be measured, as opposed to relative concentrations
- Ability to inject the gas sample directly from the sampler into a gas chromatograph for analysis
- Reusable, simple to operate and inexpensive to manufacture
- Simple routine monitoring procedure – remove gas sampler and replace with another
- Does not require pumping or disposal of contaminated water
- Hydrostatic pressure release valve allows sampler to operate at significant depth

Stage of Development

A prototype has been developed and deployed in the field. The sampler has been implemented downhole for time periods of up to four months.

Intellectual Property Status

- US 7,634,936
- PCT WO2007/132360
- EP 1987642
- CA 2,642,536

Publications

- [McLeish, K., M.C. Ryan, and A. Chu, 2007, "Integrated sampling and analytical approach for common groundwater dissolved gases", Environmental Science and Technology 41, no. 24:8388–8393](#)
- [JW Roy, MC Ryan, "In-Well Degassing Issues for Measurements of Dissolved Gases in Groundwater", In Ground Water Journal for National Ground Water Association 2010](#)