Hydrogen Water Testing & Certification

Laboratory Report

H2 Analytics
2505 Anthem Village Dr Suite E385
Henderson, NV 89052
support@h2-analytics.com

Report # H2A-240122-1

Introduction

This report summarizes our testing of the Spirit H2 hydrogen water bottle distributed by Spirit H2, Toronto, Canada. The product was tested for dissolved hydrogen concentration (H_2) on both the short (5 min) & long (10 min) cycles.

Product Description

Spirit H2 Portable Electric Hydrogen Water Bottle Model SH500 Essence V2

The product was received for testing on 1/20/2024 in factory-new packaging and included a base unit, polycarbonate bottle, screw-on cap, USB-C charging cable, and instruction manual. The bottle has an internal rechargeable battery (Li-Ion) and uses a proton exchange membrane (PEM) and platinum electrodes to produce hydrogen gas via electrolysis. After filling the bottle and securing the cap, the user can select either the 5-minute cycle (press switch once) or 10-minute cycle (press switch a second time). A digital countdown timer displays the amount of time remaining in the selected cycle. The display also indicates the battery level. As the electrolysis cycle proceeds, the hydrogen gas continues to be produced and dissolves into the water, slowly building pressure. The pressure increases the amount of H_2 gas that can dissolve in the water. The cap includes an automatic pressure relief valve to prevent an unsafe buildup of pressure, and also has a manual pressure relief valve to permit the user to release the pressure before opening the cap. The PEM design allows the bottle to produce hydrogen water using any type of potable water including RO and distilled. The water volume is approximately 225 mL when filled to the first cap thread.

Method For Measuring Dissolved Hydrogen Concentration (H_2)

Test Method: Static headspace (HS-GC) Test water type: Distilled (generic); temperature: 24.5ºC ± 1.5º ; ec: 28 us/cm; pH: 6.89
Laboratory elevation: 864 meters (0.91 atm); all measurements adjusted to SATP
Test Equipment: SRI 8610C gas chromatograph, Torrance, CA USA; Calibration: day of testing (sat H_2 std)
Column: Hayesep-D 6M; Temp: 60°C; Detector: TCD; Carrier gas: Nitrogen (99.999%) @20 PSI, 20 mL/min

Before testing, the unit's internal battery was charged overnight using the supplied charging cable and the membrane was wetted using warm (60°C) distilled water. On the day of testing, the GC was permitted to warm up for two hours and then calibrated. For each test, the bottle was connected to the power transformer (USB-C), filled with distilled water to the first thread (≈ 225 mL), and the cap was securely tightened. After completion of the desired cycle time (5 or 10 min), the cap was removed and a 100 mL sample was immediately poured into a 250 mL borosilicate beaker. A 1000 uL sample was then drawn using a gas-tight syringe. The sample was injected into the headspace vial and placed into a centrifuge for three minutes to permit the dissolved H_2 to equilibrate with the headspace. After equilibration, a 1000 uL sample of the headspace was drawn using a gas-tight syringe and injected into the gas chromatograph for analysis. Fresh distilled water was used for each test. Three tests were conducted for each cycle, the results recorded, and the mean and standard deviations calculated. The amount of ingested H_2 was calculated and shown as "Available H_2". Please note that, according to Henry's Law, the saturation level for dissolved hydrogen gas in water is 1.57 mg/L at sea level and 25°C. Attachment 1 shows a sample chromatogram for the 10-minute cycle.

Results

Short cycle (5 min): Dissolved H_2: Mean : 2.73 mg/L (ppm) SD: 0.46 Available H_2: 0.61 mg
Long cycle (10 min): Dissolved H_2: Mean : 6.23 mg/L (ppm) SD: 0.57 Available H_2: 1.40 mg

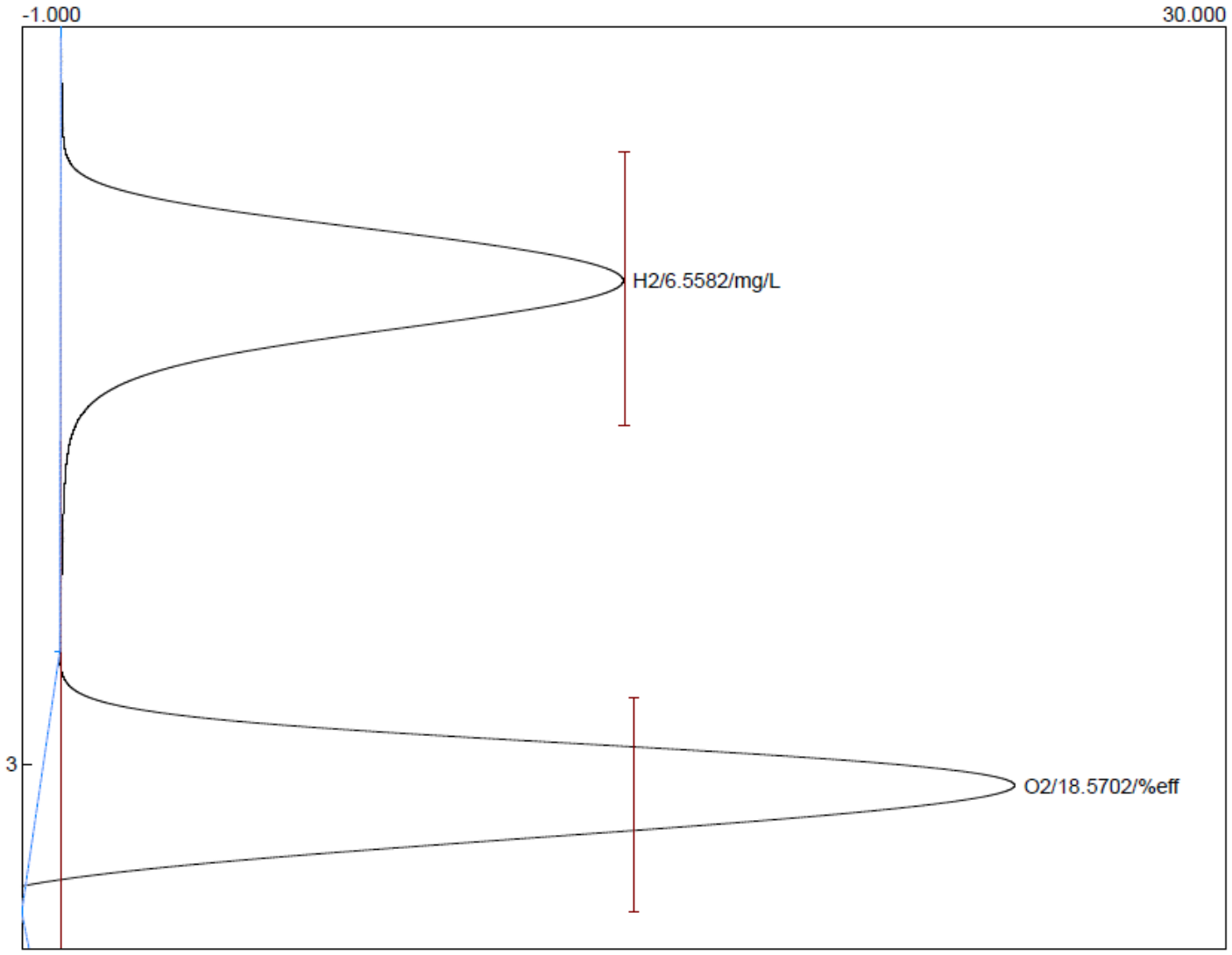
RSSharpe

Approved By: Randy Sharpe, Director of Testing

Report Date: 1/22/2024

Attachment 1: Sample chromatogram

Lab name: H2 Analytics
Client: Spirit H2
Client ID: H2A-1019
Collected: 1/22/24
Holding time: 180
Analysis date: 01/22/2024 14:12:31
Method: Static HS Analysis (GCHS)
Lab ID: HNV
Description: TCD CH1 60C
Column: Hayesep-D 6 meters 60C
Carrier: N2 @ 20psi (20 mL/min)
Components: AqH2O2.cpt
Integration: Peak sens=90.0 Base sens=90.0 Min area= 0.10 Standard= 1.000 Sample= 1.000 Tangents=off
ıntrol filename: DEFAULT.CON
Data file: Spirit H2 SH500 (10min)02..CHR ()
Sample: SH500 Esssence V2
Operator: rs
Comments: DH2 Test Run
QC batch: 225 mL



Component	Retention	Area	External	Units
H2	2.343	140.0414	6.5582	mg/L
O2	3.030	216.1770	18.5702	%eff

H2 Analytics
Hydrogen Water Testing & Certification