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Report #: 23022401

### Laboratory Report

#### Introduction

This report summarizes our analysis of the electric hydrogen water bottle distributed by Hydrogen For Health, Orem, UT. The product is a rechargeable, battery-operated portable device that uses electrolysis and pressure to infuse molecular hydrogen gas (H<sub>2</sub>) into the drinking water.

Tests requested: Dissolved H<sub>2</sub> (mg/L) on 5-min & 10-min cycles; additional tests performed: ΔpH

#### Product Description

Name: Hydrogen Rich Water Bottle      Model #: H2-2R      Lot #: N/A      Serial #: N/A

The bottle has a single-walled food grade polycarbonate reservoir with a volume of 210 mL. Because the closed-system design allows for pressure to build during electrolysis, it is capable of dissolved hydrogen concentrations higher than 1.57 mg/L, the maximum concentration at sea-level pressure (1 atm). To prevent the bottle's internal pressure from rising above the safe level during electrolysis, the cap includes an internal pressure-relief valve. The unit has two pre-programmed cycle times, 5 minutes (by pressing the power button once) and 10 minutes (by pressing the power button a second time). The bottle has a rechargeable battery to permit portable use and includes a charging cable (USB-C). The front panel display shows the battery level and the amount of time remaining in the selected cycle. Because the design utilizes a proton-exchange membrane sandwiched between two platinum-over-titanium electrodes (PEM, Nafion<sup>®</sup>), this unit will work with any type of potable water source, including distilled water, regardless of mineral content.

#### Materials & Methods

Water: generic, distilled, pH 6.29 ± 0.25; starting temperature 25.1°C ± 1.5    EC: 2 us/cm  
Laboratory elevation: 883 meters (0.90 atm); all measurements adjusted to sea level where applicable.  
Gas Chromatograph: SRI 8610C; column: Hayesep-D 6M; column/oven temp: 80°C; detector: tungsten-rhenium TCD; carrier gas: nitrogen (99.999%)  
GC Test Method: Static headspace analysis (HS-GC)  
Calibration (H<sub>2</sub>): 2-point (1.72 / 6.88 mg/L), performed on day of testing using 1000 ppm calibration gas  
The battery was fully charged and the membrane wetted overnight prior to testing. All tests were conducted with the USB charging cable connected.

For each test, the bottle was completely filled with distilled water to minimize the volume of the headspace, the cap was securely tightened, and the power button was pressed either once to start the 5-minute cycle, or twice to start the 10-minute cycle. After each cycle was completed, the bottle was shaken for 30 seconds before removing the cap and gently pouring a 100 mL sample into a glass beaker. A 1000 uL sample of the water was immediately drawn using a gas-tight syringe and then injected into the headspace vial. The vial was then agitated on an equilibrator device for five minutes to permit the dissolved H<sub>2</sub> in the water sample 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 GC for analysis. After performing three tests for each timed cycle, results were recorded, and the mean and standard deviations of the dissolved H<sub>2</sub> concentrations were calculated. Based on the mean dissolved H<sub>2</sub> concentration and the volume of water in the bottle, the average amount of H<sub>2</sub> that would be ingested when drinking the entire contents was calculated and reported as "Available H<sub>2</sub>". Tests were also performed to measure how much the bottle changed the water's original pH and reported as "ΔpH".

#### Results

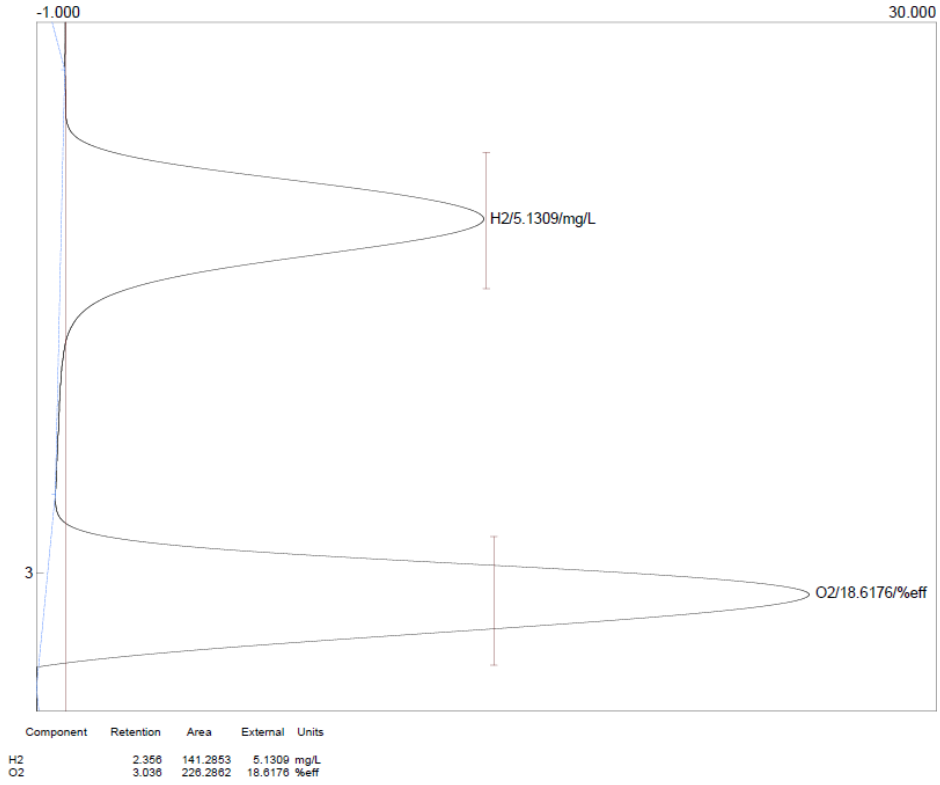
Dissolved H <sub>2</sub> (5-minute): 3.44 mg/L (3440 ppb)	SD: 0.16 mg/L	Available H <sub>2</sub> : 0.72 mg	ΔpH: + 0.15
Dissolved H <sub>2</sub> (10-minute): 5.14 mg/L (5140 ppb)	SD: 0.69 mg/L	Available H <sub>2</sub> : 1.08 mg	ΔpH: + 0.19



Approved By: *RSS* Title: Director of Testing

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Lab name: H2 Analytics  
Client: Hydrogen For Health  
Client ID: H2A-1018  
Collected: 5-27-22  
Holding time: 300  
Method: Static HS Analysis (GCHS)  
Lab ID: HNV  
Description: TCD CH1 80C  
Column: Hayeesep-D 5 meters  
Carrier: N2 @ 20psi (20 mL/min)  
Components: AqH2O2.cpt  
Integration: Peak sens=75.0 Base sens=50.0 Min area= 0.00 Standard= 1.000 Sample= 1.000 Tangents=off  
filename: DEFAULT.CON  
Data file: HydrogenForHealthH2-2R.CHR ()  
Sample: H2 Bottle  
Operator: rs  
Comments: DH2 Test Run  
QC batch: H2-2R



Sample Chromatogram (10-min Cycle)



Hydrogen For Health H2 Bottle  
Model H2-2R