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Laboratory Report

Introduction

This report summarizes the analysis of the Echo GoTM hydrogen water bottle manufactured by Echo Technologies LLC, Pleasant Grove, UT, USA. The product was tested for dissolved hydrogen concentration on both the short (5 min) & long (10 min) cycles.

Product Description

Echo GoTM Portable Hydrogen Water Bottle, Model # - Echo GoTM ; Serial #: HWB202207EG1977

The product was received for testing on 4/12/2023 in factory-new packaging and included a base unit, bottle, screw-on cap, USB wall transformer, USB-C interface cable, and user manual. The bottle has an internal rechargeable battery and uses a proton exchange membrane (PEM) and platinum electrodes to produce hydrogen gas via electrolysis. When the cap is tightly secured, the gas collects and eventually the internal pressure will rise, elevating the level of dissolved H₂ in the water above the sea level saturation point of 1.57 mg/L (1570 ppb) according to Henry's law. The PEM allows the bottle to produce hydrogen water using any type of potable water, even distilled. The water volume is approximately 275 mL. Two user-selectable cycles are available, 5 minutes & 10 minutes. The time remaining in the selected cycle is shown on the front panel digital display which also has a battery charge indicator. The cap includes an internal regulator to ensure safe working pressure.

Methods

Dissolved hydrogen concentration (H₂)

Test water: Distilled (generic); temperature: 25°C ± 1.5° ; ec: 6 us/cm; pH: 6.55
Laboratory elevation: 864 meters (0.91 atm); all measurements adjusted to SATP

Test Equipment: SRI 8610C gas chromatograph, Torrance, CA USA
Column: Hayesep-D 6M; temp: 80°C; Detector: TCD; Carrier gas: Nitrogen (99.999%) @20 PSI, 20 mL/min
Calibration: Performed on the day of testing using saturated standard

Test Method: Static headspace analysis

Before testing, the unit's internal battery was charged overnight using the supplied wall charger, and the membrane was wetted using hot (70°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 (close to, but not touching) the bottom of the cap (≈ 250 mL), and the cap was securely tightened. After completion of the desired cycle time (5 or 10 min), the cap was removed and a 1000 uL 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 H₂ 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. Three tests were conducted for each cycle time, the results recorded, and the mean and standard deviations calculated.

Results

Short cycle (5 min): Dissolved H₂: Mean - 2.43 mg/L (ppm) SD: 0.17
Long cycle (10 min): Dissolved H₂: Mean - 4.59 mg/L (ppm) SD: 0.62



Approved By:  Randy Sharpe, Director of Testing

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