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## Laboratory Report

### Introduction

This report summarizes the analysis of the Alpha Hope hydrogen tablet sold by Calerie Health™, Anaheim, CA. The tablet is manufactured by 4Excelsior, Anaheim, California, USA. The product was tested for hydrogen gas (H<sub>2</sub>) production capacity and dissolved H<sub>2</sub> concentration.

### Product Description

1) Alpha Hope Lot #: A21231004 Exp Date: 8/2023

Recommended dose, 1 tablet in 8 oz. of water (237 mL); recommended dosage, 2 tablets per day

The product was received for testing 9/2/2021 and was packaged in a new, factory-labeled and -sealed glass bottle containing a production lot number and expiration date. The bottle contains 60 tablets. Each tablet weighs approximately 700 mg and contains approximately 80 mg of elemental magnesium (Mg). The elemental form of magnesium reacts with water to produce hydrogen gas (H<sub>2</sub>) according to the equation:  $Mg + 2H_2O \Rightarrow Mg(OH)_2 + H_2$ , where one mole of H<sub>2</sub> gas is produced from each mole of magnesium. The tablet is designed to be placed into water, allowed to dissolve completely, and then consumed by drinking.

Note: The theoretical maximum H<sub>2</sub> gas production from 80 mg of elemental magnesium @ SATP is 6.67 mg (80.7 mL).

### Methods

Water temperature was 25°C ± 1.5°; laboratory elevation: 864 meters (0.91 atm); all measurements adjusted to SATP.

#### 1) H<sub>2</sub> Gas Production

Test Equipment: Water displacement apparatus w/ borosilicate 250 mL graduated cylinder  
Gas production reaction flask; borosilicate, 150 mL  
H<sub>2</sub> reaction solution: 50 mL containing 25 mL acetic acid + 25 mL distilled water  
Digital lab scale, Kubei

Test Method: Water displacement

For each test, one tablet was first weighed, then placed into the acid reaction solution. The flask's stopper was immediately replaced and the gas-evolution reaction was allowed to continue to completion. The volume of water displaced from the graduated cylinder by the gas was recorded. The amount of H<sub>2</sub> gas dissolved in the reaction solution was also measured, converted to volume units, and added to the gas production. Three tests were conducted, results recorded, and the mean and standard deviations calculated.

#### 2) Dissolved H<sub>2</sub> Concentration

Test Equipment: SRI 8610C gas chromatograph; column: Hayesep-D 6M; carrier: N<sub>2</sub>, 20psi@20mL/min; temp: 80°C; detector TCD  
Calibration: Performed on day of testing using third-party calibration gas  
GC syringe: Hamilton gastight w/Luer lock, 26ga  
Headspace vial: 40 mL borosilicate w/septum  
Test solution: Distilled water, one tablet in 237 mL (± 5 mL)

Test Method: Static headspace analysis

For each test, one tablet was weighed, then placed into the specified volume of distilled water and allowed to dissolve completely. The water was then immediately sampled using a gastight syringe. The sample was injected into the headspace vial and circulated on an equilibrator device to permit the dissolved H<sub>2</sub> to equilibrate with the headspace. The headspace was then sampled using a gastight syringe and injected into the gas chromatograph for analysis. Three tests were conducted, results recorded, and the mean and standard deviation calculated.

## Results

### 1) Alpha Hope

Gas evolution (per tablet): Volume: Mean - 85.2 mL      SD - 0.9      Mass: Mean - 7.0 mg      SD - 0.1

Dissolved H<sub>2</sub> (1 tablet in 237 mL): Mean - 8.8 mg/L (ppm)      SD - 1.4

Note: After considering the volume of water into which the tablet is placed, the mean dissolved H<sub>2</sub> of 8.8 mg/L equates to an ingested H<sub>2</sub> amount of 2.1 mg per tablet.

attachment 1: sample chromatogram



Approved By:

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Title: Director of Testing

Report Date: 9/9/2021