

TEST REPORT

Applicant : Hue light Co., Ltd.

60, Haan-ro, Gwangmyeong-si, Gyeonggi-do

Test Item : Molecular Hydrogen Inhalation Device• **Manufacturer & Model :** Hue Light Co., Ltd. / H-2000• **Serial No. :** HLH2-22-003**Date of Receipt :** 21 December 2022**Date of Test :** 26 January 2023**Description of Test**• **Test Name :** Gas analysis• **Test Site :** ☒ KRISS Lab ☐ Mobile Lab ☐ On-site• **Environmental Conditions**- **Temperature :** 20 ~ 22 °C- **Relative Humidity :** 40 ~ 60 %• **Test Method :**

Test Procedure of Mixture and Pure Gas Measurement with Gas MS(T-02-030-2000)

Test procedure of purity analysis of raw material(T-02-055-2017)

• **Test Results :**

Refer to the "TEST RESULTS" on the next page(s).

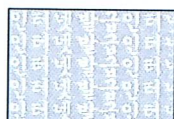
• **Measurement Uncertainty :**

Refer to the "TEST RESULTS" on the next page(s).

General Information

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- The above results are valid only for the sample provided by the applicant, and the name of the sample is provided by the applicant.

• **Date of Issue :** 26 January 2023• **Tested by :** Lee, Jin Bok• **Approved by :** Jung, Jin Sang**President of KRISS**

TEST RESULTS

1. Request details

Hue Light Corp. requested for analyzing the concentrations of the hydrogen, oxygen gas, impurities and the flow rate of the gas from a Molecular Hydrogen Inhalation Device (this is referred to as a "Test sample").

2. Principles of the test sample device

The test sample is a device that electrolysis water to generate hydrogen and oxygen gas. It is discharged through one water trap without separating the generated hydrogen and oxygen gas (also called brown gas).

3. Product specifications

(1) Device name: Molecular Hydrogen Inhalation Device

(2) Model No.: H-2000

(3) S/N: HLH2-22-003

4. Test procedure

(1) Test sample were installed at KRISS laboratory (Fig. 1).

(2) A sampling kit and a 10 L sampling bag were installed at the outlet to collect the gas generated from the Test sample.

(3) After operating the Test sample for about 5 hours or more, the generated gas was collected in a sampling bag.

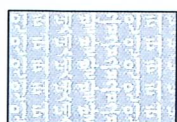
(4) CO, CH₄, CO₂ and THC(C₂~C₄) were analyzed using GC/Detectors.

(5) H₂, O₂, Ar and N₂ concentrations were measured for the samples collected in the sampling kit using a gas precision mass spectrometer (GAS-MS).

(6) Gas flow rate was measured for 40 minutes using a calibrated wet flow meter.



Fig. 1 Equipment configuration installed in KRISS at Hue Light Co., Ltd.
(Continue to page 3)



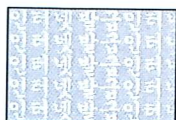
TEST RESULTS

5. Results

Components	Test results
H ₂	67.38 cmol/mol ⁽¹⁾ , Relative expanded uncertainty ($k=2$): 0.5 %
O ₂	32.44 cmol/mol, Relative expanded uncertainty ($k=2$): 1 %
N ₂	0.18 cmol/mol, Relative expanded uncertainty ($k=2$): 5 %
Ar	79.2 μmol/mol ⁽²⁾ , Relative expanded uncertainty ($k=2$): 10 %
CH ₄	N.D ⁽³⁾ (Detection limit : 0.2 μmol/mol)
CO	0.02 μmol/mol, Relative expanded uncertainty ($k=2$): 50 %
CO ₂	13.2 μmol/mol, Relative expanded uncertainty ($k=2$): 3 %
THC(C ₂ ~C ₄)	N.D(Detection limit : 0.3 μmol/mol)
Flow rate	2.17 L/min, Relative expanded uncertainty ($k=2$): 3 %

6. Analytical instruments: Gas-MS(MAT 271), GC-FID/FID-methanator, Sampling kit, sampling bag, Integrated flowmeter(Shinagawa W-NK-0.5A)
7. The measured value of the gas component is the mole fraction excluding water.
8. cmol/mol⁽¹⁾ and μmol/mol⁽²⁾ can be expressed as % and ppm, respectively.
9. N.D.⁽³⁾ is not detected.
10. The relative expanded uncertainty ($k = 2$) is a level of confidence of approximately 95%.
11. The amount of gas generated and the measured value may vary depending on the voltage and current flowing through the electrode and the area of the electrode plate.
12. <Caution> Avoid ignition sources (fire, static electricity, etc.) at the inlet of the gas outlet of this test product (hydrogen generator). If an ignition source occurs, it may cause sparks or ignition. Therefore, when using the equipment, avoid a completely enclosed space and attention must be paid to the safety of the ignition sources.
13. This test result is issued at the given date. KRISS is not responsible for any change of the sample since the issued date. This test result is valid just for the given item.
14. This test report is no valid if it is copied.

(End of the Results).



TEST REPORT

Applicant : Hue light Co., Ltd.

60, Haan-ro, Gwangmyeong-si, Gyeonggi-do

Test Item : Molecular Hydrogen Inhalation Device

• Manufacturer & Model : Hue Light Co., Ltd. / H-1200

• Serial No. : -

Date of Receipt : 28 April 2021

Date of Test : 03 June 2021

Description of Test

• Test Name : Gas analysis

• Test Site : ☒ KRISS Lab ☐ Mobile Lab ☐ On-site

• Environmental Conditions

- Temperature : 20 ~ 22 °C

- Relative Humidity : 40 ~ 60 %

• Test Method :

Test procedure of purity analysis of raw material(T-02-055-2017)

Test Procedure of Mixture and Pure Gas Measurement with Gas MS(T-02-030-2000)

• Test Results :

Refer to the "TEST RESULTS" on the next page(s).

• Measurement Uncertainty :

Refer to the "TEST RESULTS" on the next page(s).

General Information

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• Date of Issue : 17 June 2021

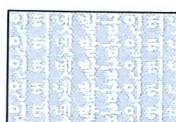
• Tested by : Lee, Jin Bok



• Approved by : Jung, Jin Sang



President of KRISS



TEST RESULTS

1. Request details

Hue Light Corp. requested for analyzing the concentrations of the hydrogen, oxygen gas, impurities and the flow rate of the gas from a Molecular Hydrogen Inhalation Device (this is referred to as a "Test sample").

2. Principles of the test sample device

The test sample is a device that electrolysis water to generate hydrogen and oxygen gas. It is discharged through one water trap without separating the generated hydrogen and oxygen gas (also called brown gas).

3. Product specifications

(1) Device name: Molecular Hydrogen Inhalation Device

(2) Model No.: H-1200

(3) Certification No.: R-R-hLi-H-1200(KC)

4. Test procedure

(1) Test sample were installed at KRISS laboratory (Fig. 1).

(2) A sampling kit and a 10 L sampling bag were installed at the outlet to collect the gas generated from the Test sample.

(3) After operating the Test sample for about 5 hours or more, the generated gas was collected in a sampling bag.

(4) CO, CH₄, THC(C₂~C₄), benzene, toluene, xylene, ethylbenzene, and styrene were analyzed using GC/Detectors.

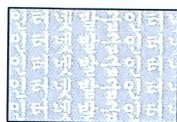
(5) H₂, O₂, Ar, N₂, and CO₂ concentrations were measured for the samples collected in the sampling kit using a gas precision mass spectrometer (GAS-MS).

(6) Gas flow rate was measured for 40 minutes using a calibrated wet flow meter.



Fig. 1 Equipment configuration installed in KRISS at Hue Light Co., Ltd.

(Continue to page 3)



TEST RESULTS

5. Results

Components	Test results
H ₂	66.71 cmol/mol ¹⁾ , Relative expanded uncertainty ($k=2$): 0.5 %
O ₂	33.26 cmol/mol, Relative expanded uncertainty ($k=2$): 1 %
N ₂	0.025 cmol/mol, Relative expanded uncertainty ($k=2$): 5 %
Ar	15.8 μmol/mol ²⁾ , Relative expanded uncertainty ($k=2$): 10 %
CH ₄	N.D. ³⁾ (Detection limit : 0.2 μmol/mol)
CO	0.2 μmol/mol 이하
CO ₂	63.9 μmol/mol, Relative expanded uncertainty ($k=2$): 3 %
THC(C ₂ ~C ₄)	N.D(Detection limit : 0.3 μmol/mol)
Benzene	0.02 μmol/mol blow
Toluene	0.02 μmol/mol blow
Xylene	N.D(Detection limit : 0.05 μmol/mol)
Ethyl benzene	N.D(Detection limit : 0.05 μmol/mol)
Styrene	N.D(Detection limit : 0.05 μmol/mol)
Flow rate	1.33 L/min, Relative expanded uncertainty ($k=2$): 3 %

6. Analytical instruments: Gas-MS(MAT 271), GC-PDD/FID-methanator, Sampling kit, sampling bag, Integrated flowmeter(Shinagawa W-NK-0.5A)

7. The measured value of the gas component is the mole fraction excluding water.

8. cmol/mol¹⁾ and μmol/mol²⁾ can be expressed as % and ppm, respectively.

9. N.D.³⁾ is not detected.

10. The relative expanded uncertainty ($k = 2$) is a level of confidence of approximately 95%.

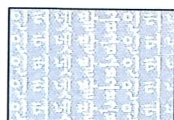
11. The amount of gas generated and the measured value may vary depending on the voltage and current flowing through the electrode and the area of the electrode plate.

12. <Caution> Avoid ignition sources (fire, static electricity, etc.) at the inlet of the gas outlet of this test product (hydrogen generator). If an ignition source occurs, it may cause sparks or ignition. Therefore, when using the equipment, avoid a completely enclosed space and attention must be paid to the safety of the ignition sources.

13. This test result is issued at the given date. KRISS is not responsible for any change of the sample since the issued date. This test result is valid just for the given item.

14. This test report is no valid if it is copied.

(End of the Results).



시험 성적서

TEST REPORT

의뢰기관_Applicant : 주식회사 휴라이트

주소_Address : 경기도 광명시 하안로 60 제E동 13층 1311 (소하동, 광명테크노파크)

시험대상_Test Item : 분자수소흡입장치

제작회사 및 형식_Manufacturer & Model : Hue Light Co., Ltd. / H-2000

기기번호_Serial No : HLH2-22-003

접수일자_Date of Receipt : 2022. 12. 21

시험일자_Date of Test : 2023. 01. 26

시험내용_Description of Test

시험명_Test Name : 가스분석

시험장소_Test Site : ☒ KRIS표준실_KRIS Lab ☐ 이동시설_Mobile Lab ☐ 현장_On-site

시험환경_Environmental Conditions

온도_Temperature : 20 ~ 22 °C

상대습도_Relative Humidity : 40 ~ 60 %

시험방법_Test Method :

Gas MS에 의한 혼합 및 순수가스분석시험절차(T-02-030-2000)

원료물질의 순도분석절차(T-02-055-2017)

시험결과_Test Results :

다음 쪽 "시험결과" 참조

측정불확도_Measurement Uncertainty :

다음 쪽 "시험결과" 참조

담당자_Tested by : 이진복



책임자_Approved by : 정진상



2023년 1월 26일

국가측정표준대표기관 National Metrology Institute

한국표준과학연구원장 (인)



이 성적서를 한국표준과학연구원장 승인 없이 수정 또는 부분 복제하여 사용하거나 광고 및 제품 홍보 등에 사용할 경우 법적 조치를 받을 수 있습니다.

위 시험 결과는 의뢰자가 제공한 시험품에 한하여 유효하며, 시료명은 의뢰자가 제공한 것입니다.

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시험결과

TEST RESULTS

1. 의뢰 내용

(주)휴라이트에서는 “분자수소흡입장치” (이하 “시험품” 이라 함)에서 발생하는 수소소가스의 농도 불순물 및 가스의 토출유량 측정을 의뢰하였다.

2. 원리

시험품은 물을 전기분해시켜 수소와 산소가스를 발생시키는 장치이다. 발생된 수소와 산소가스를 분리하지 않고 1개의 water trap을 통과하여 토출된다(일명 Brown gas라 함).

3. 제품 사양

(1) 장치명: 분자수소흡입장치(Molecular Hydrogen Inhalation Device)

(2) Model No.: H-2000

(3) S/N: HLH2-22-003

4. 실험방법

(1) (주)휴라이트에서는 Fig. 1과 같이 시험품을 한국표준과학연구원에 설치하였다.

(2) 시험품에서 발생한 가스를 포집하기 위하여 토출구에 sampling kit와 10 L sampling bag을 설치하였다.

(3) 시험품을 약 5시간 이상 작동시킨 후 발생한 가스를 sampling bag에 포집하였다.

(4) GC를 사용하여 CO, CH₄, CO₂, THC(C₁ ~ C₄) 성분을 분석하였다.

(5) Sampling kit에 포집한 시료는 가스정밀질량분석기(GAS-MS)를 이용하여 H₂, O₂, Ar, N₂ 농도를 측정하였다.

(6) 가스유량은 교정된 습식적산유량계를 이용하여 40분 동안의 총발생량을 측정하였다.



Fig. 1 (주)휴라이트 분자수소흡입장치



(3페이지 중 3에 계속)

시험결과

TEST RESULTS

5. 측정결과

성분	측정값(물분율)
H ₂	67.38 cmol/mol ⁽¹⁾ , 상대확장불확도 0.5 % (신뢰의 수준: 약 95 %, $k=2$)
O ₂	32.44 cmol/mol, 상대확장불확도 1 % (신뢰의 수준: 약 95 %, $k=2$)
N ₂	0.18 cmol/mol, 상대확장불확도 5 % (신뢰의 수준: 약 95 %, $k=2$)
Ar	79.2 μmol/mol ⁽²⁾ , 상대확장불확도 10 % (신뢰의 수준: 약 95 %, $k=2$)
CH ₄	N.D ⁽³⁾ (Detection limit : 0.2 μmol/mol)
CO	0.02 μmol/mol, 상대확장불확도 50 % (신뢰의 수준: 약 95 %, $k=2$)
CO ₂	13.2 μmol/mol, 상대확장불확도 5 % (신뢰의 수준: 약 95 %, $k=2$)
THC(C ₂ ~C ₄)	N.D(Detection limit : 0.3 μmol/mol)
유량	2.17 L/min, 상대확장불확도 3 % (신뢰의 수준: 약 95 %, $k=2$)

6. 분석장비 : 질량분석기(Gas-MS, MAT271), GC-FID/FID-methanator, Sampling kit, sampling bag, 습식적산유량계(Shinagawa W-NK-0.5A)

7. 가스성분의 측정값은 수분을 제외한 물 분율이다.

8. 통상적으로 ⁽¹⁾cmol/mol은 %로, ⁽²⁾μmol/mol은 ppm으로 표기하기도 한다.

9. ⁽³⁾N.D.는 not detected이다.

10. 상대확장불확도는 약 95 % ($k = 2$) 신뢰수준이다.

11. 가스 발생량과 측정값은 전극에 흐르는 전압, 전류 및 전극판의 면적에 따라 달라 질 수 있다.

12. <주의사항> 본 시험품(수산소 발생기) 기체 토출구의 입구에 점화원(화기, 정전기등)이 발생할 경우 스파크 또는 발화가 될 수 있다. 따라서 장비를 사용 할 때는 밀폐된 공간을 피하고 점화원등 안전에 주의해야 한다.

13. 본 시험검사에 표시된 화학량은 분석기간 동안에 취한 시험품에 대한 시험결과이며 다른 동종 제품의 대표성을 갖지 않는다.

14. 본 성적서를 복사한 것은 성적서로서 효력이 없다.

끝(End of the Results).

