Gas phase calibration of H2 UniAmp sensor

Date: 2025-05-12
Tags: AE | H2 | H2 Evolution | H2 Sensor
Category: Protocol
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Goal

2 point gas phase calibration of Equipment - H2 UniAmp Sensor with Equipment - H2 UniAmp Single Channel System

Prerequisites and preparation

Everything listed in Protocol - Getting hydrogen from hydrogen bottle in CEEC II E014

Equipment - H2 UniAmp Sensor

Equipment - H2 UniAmp Single Channel System

Prep work - AE-482: Volume determination of GL14/NS14 5 mL Schlnek flask

100 µL Hamilton syringe

BOLA fitting (2 mm hole)

Milli-Q water

Safety

Everything stated in Protocol - Getting hydrogen from hydrogen bottle in CEEC II E014

Be careful with sensor, sensitive to touch

Polarization needs to be 100 mV (will be adjusted automatically when connected to Equipment - H2 UniAmp Single Channel System and Equipment - H2 UniAmp Sensor

Steps

Step number	Step description	Pictures
0. Build setup I	Start the Laptop Plug it in (is always needed for grounding of the setup) Connect the Equipment - H2 UniAmp Single Channel System with a USB-C USB-A to the laptop (Light on the device will turn on an green) Connect the Equipment - H2 UniAmp Sensor to the device (Light on the device will turn off for 100 ms) Connect the PT100	

1. Start software	If not installed: Install from https://unisense.com/product-category/software/ Open software (Unisnese logger) on Laptop icon.png You get to a view of connected sensors. Should look somewhat like the picture start page of software.png • In column use: select if sensor reading should be measured during experiment • In column unit for the hydrogen sensor the unit can be changed (at the moment: µmol/L for liquid phase) Press start experiment Data is saved in Documents / Unisense Data --> There save experiment in a folder with your abbriviation, give experiment a name save file.png	icon.png start page of software.png save file.png
2. Measurment configuration	In software go to Calibration: • check in field UniAmp Channel Configuration that Polarisation is set to 100 mV - do never change that value if value is different immediatly stop experiment, disconnect everything and inform AE • Preamp Gain is typically set to 1pA=1mV, before changing it ask AE • Offset can be adjusted, so that signal is as close to 0 mV as possible • select solubility temperature compensation and sensor temperature compensation, when PT100 is connected	Channel Configuration.png
2a. Conditioning	In software go to Data Logger: set sample interval to 10 s and sart measurment (green triangle below sampling intervall) In top of view sensors it can be selected which sensors are shown below, on the right some options are shown to play around with the visualization Wait until signal is stable (for start wait at least 20 min) - do not plug out anything, since than conditioning has to be repeated	Measurment 1.png
3. Preparing Hydrogen saturated water	Prepare a 5 mL flask with approx. 5 mL Milli-Q water and a septum. Use double ballons (speak ballon inside another ballon) and use two ballon volumes for H2 bubbling. Get hydrogen according to Protocol - Getting hydrogen from hydrogen bottle in CEEC II E014 - **follow stated safety measures** Flush the flask with hydrogen by placing the ballon with cannula into the water and allow the gas to be purged with another cannula not connected to anything Let bubble for at least 20 min When ballon is nearly empty the cannula not connected to anything can be removed	

4. Build setup II	After step 2a and 3 are finished: Stop experiment in software by pressing green square or by closing the software Build the NS14/Gl14 flask with a valve and a septum on the NS14 During that add milli-q water (1 mL) with a Eppendorf pipette to the flask. Also add a stir bar and start the stirring Remove the protective plastic hull from the sensor Add sensor to the flask using a 2.0 mm BOLA fitting - be careful to not damage the BOLA fitting or the sensor Adjust sample interval to 1 s Start new measurment by pressing on the green tiangle Wait until signal is stable (typically in less than 5 min)	
5. Take calibration point at 0 ppm	In software: go to calibration In field "Sensor calibration & experiment settings": Adjust Temp. in drop down menu next to it to PT1000 when PT1000 is used, otherwise adjust temperature directly to desired temperature Press on field "clear all points" Press button "Add point" Go to "Comment" and write there, when calibration point was taken or take note manually	calibration.png
6. Take calibration point with hydrogen inside	Click on field "H2 table" and put in amount of hydrogen in ppm, as well as the temperature and pressure measured from the device Add desired amount (100 µL = 9381 ppm = 0.938 %) of water saturated hydrogen (gas phase of flask) prepared in step 3 (should give concentration in the end similar to highest expected hydrogen concentration of experiment) with the gas tight hamilton syringe - close the srinyge while transfering hydrogen Wait till maximal hydrogen concentration is reached, than press add point. Note done when hydrogen was added and when calibration point was taken	
7. Save calibration	Press field "Save and use calibration" Check at bottom of window, that correct calibration is now selected (most recent one) Stop experiment in software by pressing green square in Data Logger	
8. Dissasamble setup	Remove BOLA fitting and sensor from flask Do not disconnect from device and so on	

9. Cleaning of sensor	Sensor should not be dirty - so no cleaning needed, but it takes several minutes for the signal to go back to baseline value If no other expirments are planned for the day: Make sure that the sensor is acutally dry and place it back in the protective hull and than in the storage box	
10. Save data	Data is auomatically saved in format .ulog, which can always be opend with the software from unisnese Data can be experoted as excel file, .csv or picture from Data Logger In experiment note done relevant obtained values from calibration (slope and intecept) as well as H2 concentraiton used for 2nd calibration point	

Linked resources

- Equipment - EPR, CEEC I lab K002
- Equipment - H2 UniAmp Sensor - Low range - 2.1 x 80 mm needle
- Equipment - H2 UniAmp Single Channel System
- Protocol - EPR measurement on EPR, CEEC I lab K002
- Protocol - Getting hydrogen from hydrogen bottle in CEEC II E014
- Protocol - Liquid phase calibration of H2 UniAmp sensor

Attached files

calibration.png
sha256: 1aee43ae9c51f6ab16da305a1cb2514edac3d8835c3224cc131101789bb60baf

Measurment-1.png
sha256: 1ef332f79186f52c4f1787d4736abe44134077bdbaddef7022d43da623538887

Channel-Configuration.png
sha256: e6356a65c278ad48ea8c0064e75060804576a52121045317b4f18636ee752ddd

save-file.png
sha256: 17fbf002499bf45a5990d17dec2be25270e397437359f030238ae4af8f2ebc75

start-page-of-software.png
sha256: d44ecd9a4cc534851b2236a78fb3deb14f6649813a13b94355a68f3a0bac84e7

icon.png
sha256: 20103d3125a59f726b00e54e5d70b13d6052dd22ed9390da9a4522e4d3da4e13

Comment

On 2025-05-27 19:08:42 Nadzeya Brezhneva wrote:
Notes:
Future recommendation: placing water into NS14/GL14 Schlenk where H2 measurement is performed

Unique eLabID: 20250512-b5af754f312800aa983ea02c2d448b8753fc93e6
Link: https://elab.water-splitting.org/database.php?mode=view&id=225