UCD CSN Technical Information #402H

Sucrose Generation

Chemical Speciation Network
Air Quality Research Center
University of California, Davis

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DOCUMENT HISTORY

Revision	Release Date	Initials	Section/s Modified	Brief Description of Modifications
1.2	5/11/2021	AB	8, 9, 10	Added 1 – 10 µL pipette to the equipment list in Sect. 8. Provided link for "Sucrose Standard Generation Form" in Sect. 9.2 and for the sucrose database in Sect. 9.18. Updated stock volume and final standard volume of Sucrose Standard 16 in Table 1 in Sect. 9. Provided archival storage procedure for printed form of "Sucrose Standard Generation Form" in Sect. 10
1.3	11/30/2022	YL	8, Appendix A	Updated sucrose purity, removed specific lot number for sucrose in appendix A.

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1. PURPOSE AND APPLICABILITY

The subject of this technical information (TI) is to describe the procedures for generating the six sucrose solution standards used to create the calibration curve for the Sunset Carbon Analyzers.

2. SUMMARY OF THE METHOD

The six sucrose solution standards are generated every six months as that is their shelf life. A sucrose stock solution is generated from reagent grade crystalline sucrose dissolved in deionized water. Other standard solutions are generated from diluted aliquots of the stock solution.

3. DEFINITIONS

Not applicable.

4. HEALTH AND SAFETY WARNINGS

Not applicable.

5. CAUTIONS

Not applicable.

6. INTERFERENCES

Not applicable.

7. PERSONNEL QUALIFICATIONS, DUTIES, AND TRAINING

Only trained lab personnel designated by the Laboratory Manager may perform the procedure.

8. EQUIPMENT AND SUPPLIES

- Analytical Balance (Mettler Toledo MS104TS or equivalent)
- NIST-Traceable Class 1 Calibration Weights
- Laboratory Spoon/Spatula
- Weigh Boats/Paper
- Filtered Deionized Water
- Sucrose, ≥ 99.5 % Purity
- 2 100 mL Class A Volumetric Flasks with caps
- 4 10 mL Class A Volumetric Flasks with stoppers
- 100 – 1000 µL and 1 – 10 µL Pipettor with Tips

- Ultrasonic Bath
- Muffle furnace (Thermo Scientific Thermolyne FB1415M or equivalent)
- 6 10 mL sample jars with lids
- Pre-generated sample jar labels with barcode
- Quartz Carbon Laboratory Sucrose Standard Generation Form

9. PROCEDURAL STEPS

1. Make sure all glassware is clean by thoroughly rinsing each piece with DI water and either allowing to air-dry or drying in the oven for 1 hour at 100 °C and allowing to cool to room temperature.
2. Check the analytical balance with the 1, 2, 5, and 10 g class 1 weights. Record the reference weight values in grams (g) on the Quartz Carbon Laboratory Sucrose Standard Generation Form and fill out the balance information. Electronic format of the form can be found at U:\IMPROVE_Lab\Carbon Analysis Lab\Daily Operation files\Sucrose Generation\Sucrose generation forms.
3. Generate the sucrose stock solution(QC|Sucrose|11) with a target concentration of 210.51 µgC/10 µL, via steps 4-10.
4. Place either a weighing boat or a weighing paper on the balance and tare.
5. Using the laboratory spoon, weigh out 5.0250 g of sucrose onto the boat/paper. Record the actual sucrose mass on the sucrose generation form and calculate the corresponding stock solution concentration using the formula provided.
6. Carefully transfer all of the weighed sucrose into a 100 mL volumetric flask.
7. Fill the volumetric flask approximately 50 % full with DI water, cap it, and shake vigorously until the sucrose crystals fully dissolve into solution.
8. Carefully fill the rest of the flask precisely to the line with DI water, utilizing the pipettor when nearing the line. If overfilled, do not remove solution from the flask, instead discard the solution and start over from step 1.
9. Cap the flask and shake vigorously for one minute.
10. Place the flask into the DI water-filled ultrasonic bath and sonicate for approximately 10 minutes.
11. Test the solution via section 8.1.2 of the TOR Carbon Analysis SOP402.
12. If the solution meets the QC criteria (i.e. measured TC value within ± 7 % of the calculated TC concentration), proceed to generate the other five standards from aliquots of this sucrose stock solution.
13. Record the pipette information on the Quartz Carbon Laboratory Sucrose Standard Generation Form. Using the pipettor, transfer the appropriate volume of the sucrose stock solution to the appropriate clean volumetric flask, depending on which standard is being generated, as denoted by Table 1.

14. Fill the volumetric flask to the line with DI water, using the pipettor when necessary. If overfilled, discard the solution and start over from step 13.
15. Invert the flask several times to homogenize the solution.
16. Transfer the solution to a pre-labeledsample jar with the corresponding "QC|Sucrose|ID#" barcode. Write down the generation date and your initials on the label.
17. Repeat steps 13-16 until all standards have been generated.
18. Enter the required information (i.e. actual concentration, generation date, expiration date, analyst initial and analysis QC code) for the newly generated standards onto the Quartz Carbon Laboratory Sucrose Standard Generation Form and into the database via the CSN Management Site (https://csn.aqrc.ucdavis.edu/Sucrose).

Table 1. Target concentrations of sucrose standards 11-16 and dilution factors.

	Sucrose Stock (µgC/10µL)	Volume of Stock (ml)	Volume Final (ml)	Dilution Factor	Final Concentration (µgC/10µL)
QC|Sucrose|11	210.51	NA	100 ml	NA	210.51
QC|Sucrose|12	210.51	5.0 ml	10 ml	2X	105.26
QC|Sucrose|13	210.51	2.0 ml	10 ml	5X	42.10
QC|Sucrose|14	210.51	1.0 ml	10 ml	10X	21.05
QC|Sucrose|15	210.51	0.5 ml	10 ml	20X	10.53
QC|Sucrose|16	210.51	0.1 ml	10 ml	100X	2.105

10. QUALITY ASSURANCE AND QUALITY CONTROL

- Prior to weighing sucrose, the balance should be checked with the set of reference weights for accuracy. The measurements of all 4 reference weights should be within their certified value ± acceptance criteria specified in the Reference Weights table in Appendix A.
- Upon completion of the Quartz Carbon Laboratory Sucrose Standard Generation Form, the form will be checked by another trained analyst for completeness and accuracy (calculation of final concentrations). That analyst will initial and date the "QC'd by:" entry on the form. Finally, place the form inside the related classor in the carbon lab.

11. REFERENCES

Appendix A: Quartz Carbon Laboratory Sucrose Standard Generation Form (see below).

Appendix A

Quartz Carbon Laboratory

Sucrose Standard Generation Form

Performed by

Initials: _____

Date: _____

QC'd by

Initials: _____

Date: _____

Sucrose information

Manufacturer: Sigma

Part number: S7903-250G

Lot number: _____

Purity: ≥ 99.5 %

Opened date: _____

Expiration date: _____

Balance information

Manufacturer: Mettler Toledo

Model number: MS104TS

Serial number: B021037406

Last Calibration Date: _____

Reference Weights

Serial Number	Nominal Weight (g)	Certified Date	Certified Weight (g)	Acceptance Criteria (g)*	Measured Weight (g)	Pass/Fail
	10			± 0.0005		
	5			± 0.0005		
	2			± 0.0005		
	1			± 0.0005		

*Acceptance criteria is based on the certified weight.

Pipette

Manufacturer: Mettler Toledo Rainin

Model number: SL-1000XLS+

Serial number: C006977231

Last Calibration Date: _____

Stock Solution Preparation

Sucrose Stock solution (QC|Sucrose|11): Dissolve 5.0250 g of Sucrose in 100 mL volumetric flask

Weighed sucrose mass (g) _____; calculated stock concentration (µgC in 10 µL):_____(using equation below)

$$concentration = \left(\frac{weighed\ sucrose\ mass\ (g) \times 0.995(purity)}{100\ mL\ soln}\right)\left(\frac{(12)(12.01gC)}{342.31g\ sucrose}\right)\left(\frac{1mL}{10^3\mu L}\right)\left(\frac{10^6\mu g}{1g}\right) * 10\mu L$$

Dilutions

Standard Name	Sucrose Stock (µgC in 10µL)	Volume of Stock (ml)	Volume Final (ml)	Final Concentration (µgC in 10µL)	Generation Date	Expiration Date*
QC|Sucrose|12		5.0 ml	10 ml			
QC|Sucrose|13		2.0 ml	10 ml			
QC|Sucrose|14		1.0 ml	10 ml			
QC|Sucrose|15		0.5 ml	10 ml			
QC|Sucrose|16		0.1 ml	10 ml			

*Solutions expire 6 months after the generation date.