Candied Cedar Bark: The Treatment of Waterlogged Western Red Cedar Bark using Sucrose

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Introduction

Western red cedar bark has been used for centuries by the First Nations peoples of the Northwest Coast; but the objects made from this material rarely survive in archaeological sites unless they are found in waterlogged conditions. The survival of these materials is dependent upon their conservation treatment following excavation. Traditionally waterlogged archaeological cedar bark has been treated with polyethylene glycol 400 (PEG 400), but this treatment has received mixed reviews and it does not always produce a predictable result. Sucrose has been used successfully as an impregnant for waterlogged wood for many years, but so far its use has not been attempted on bark. The purpose of this investigation was to determine whether waterlogged western red cedar bark could be successfully treated using sucrose.

Experimental

Step One: Impregnation

Sample Material	Source and Preparation					
N: Normal	Waterlogged at CCI for 14 years					
D: Degraded	Waterlogged at CCI for 14 years and then further degraded in a 1% solution of NaOH for 1 week					
A: Archaeological	Archaeological cedar bark from the Lachane site in Prince Rupert Harbour, donated by the Canadian Museum of Civilizations with help from CCI.					
C: Control	Samples of each type of material (illustrated above) left untreated					
Speed of Impregnation	**2 weeks**	**2 weeks**	**2 weeks**	**2 weeks**	**2 weeks**	**2 weeks**
A: Accelerated	30%	50%	70%	-	-	-
G: Gradual	10%	20%	40%	50%	60%	70%
Temperature (°C)						
RT: Room temperature	Approx. 23°C					
ET: Elevated temperature	Approx. 50°C (+/- 5°C)					
PEG: PEG 400 solution, room temperature	Approx. 23°C					
Length of Time in Solution						
2	two months					
3	three months					
4	four months					
6	six months					

Method of sucrose impregnation.

Step Two: Air Drying

Samples in solution

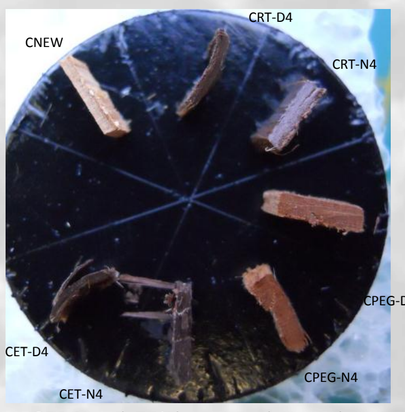
4-month samples air drying

Step Three: Examination

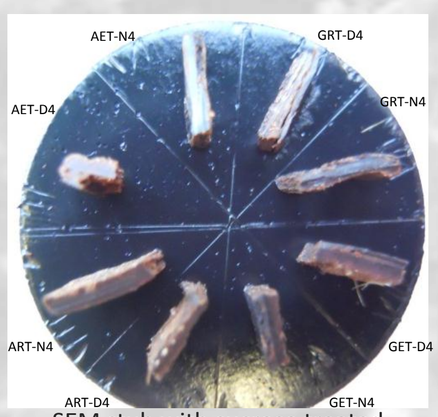
- Measurements: before and after treatment
- Analysis of Handling Properties
- Scanning Electron Microscopy
- Calculating Mass: before , during, and after treatment

4-month Results

Dimensional Change



SEM stub with control samples



SEM stub with sucrose treated samples.

Dimensional Change Summary

Shrinking

- PEG samples retain the waterlogged swollen thickness
- Untreated samples shrink the most
- New cedar bark is not as thick as PEG samples
- Sucrose samples closest to new cedar bark thickness

Warping

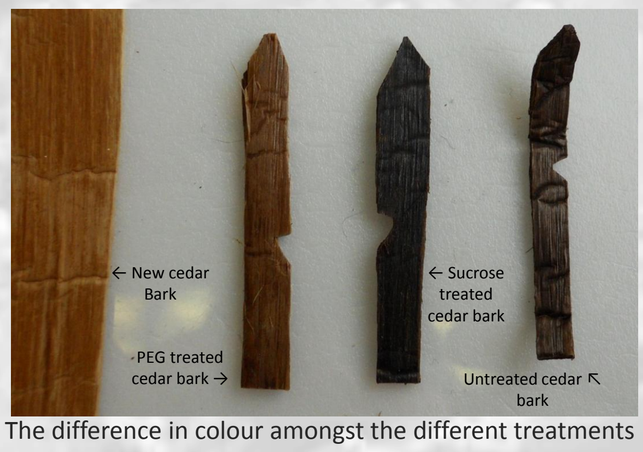
- Most sucrose treated samples warped slightly
- Untreated samples warped the most in all directions
- PEG treated samples did not warp
- **GRT-N4** did **not warp** and had the **least shrinkage** of the sucrose treated samples

Mass of Sucrose Absorbed

Speed of Impregnation	Temperature of Solution	Sample	Mass Sucrose (g)	% sucrose
Accelerated Impregnation (30%, 50%, 70%)	Elevated Temperature (50°C)	AET-D4	**0.0893**	46.61%
		AET-N4	**0.11745**	53.09%
	Room Temperature (23°C)	ART-D4	**0.1228**	59.60%
		ART-N4	**0.10803**	53.12%
Gradual Impregnation (10%, 20%, 40%, 50%, 60%, 70%)	Elevated Temperature (50°C)	G1ET-D4	**0.08442**	46.34%
		G1ET-N4	**0.09875**	43.25%
	Room Temperature (23°C)	G1RT-D4	**0.13083**	49.68%
		G1RT-N4	**0.10227**	38.96%

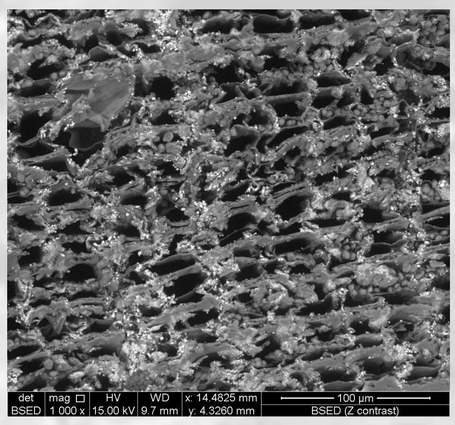
Mass of sucrose absorbed by samples.

Colour

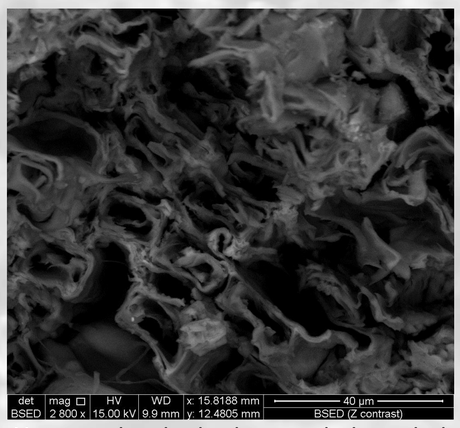


The difference in colour amongst the different treatments

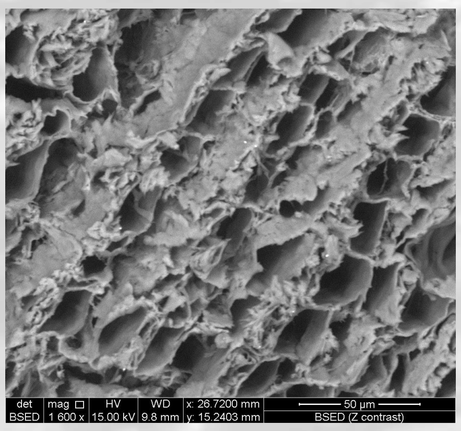
Scanning Electron Microscopy



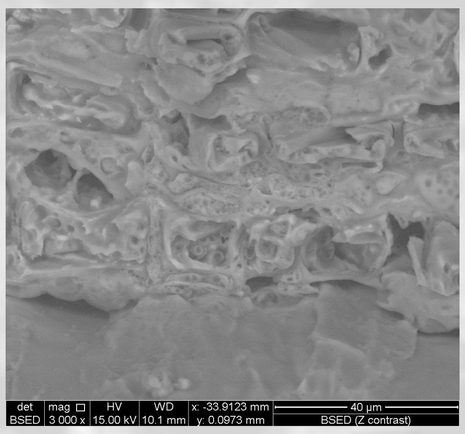
New cedar bark control: never been waterlogged, 23°C, CNEW



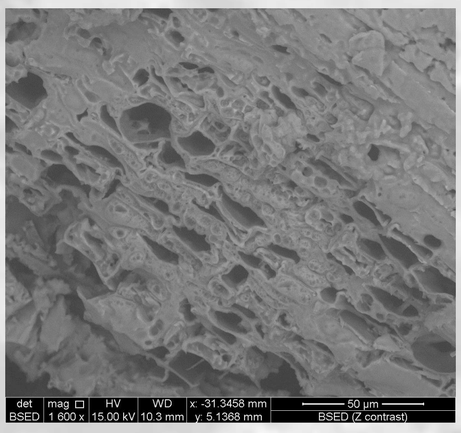
Untreated cedar bark control: degraded material, 23°C, CRT-D4



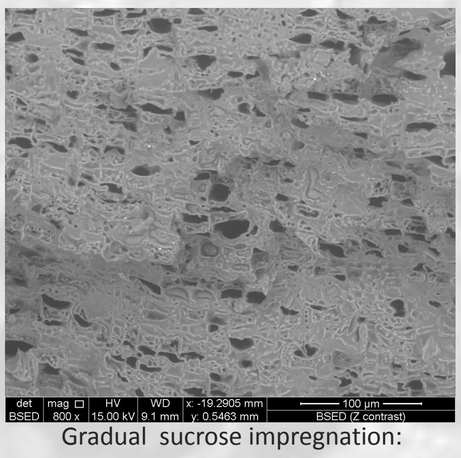
PEG 400 treated cedar bark control: degraded material, 23°C, PEG-D4



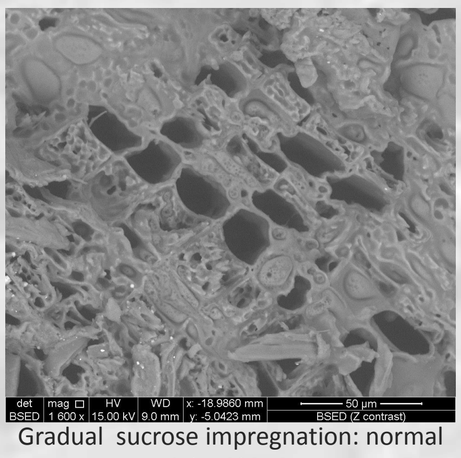
Accelerated sucrose impregnation: degraded material, 50°C, AET-D4



Accelerated sucrose impregnation: normal material, 50°C, AET-N4



Gradual sucrose impregnation: degraded material, 50°C, GET-D4



Gradual sucrose impregnation: normal material, 50°C, GET-N4

Handling Properties

PEG Treated Samples

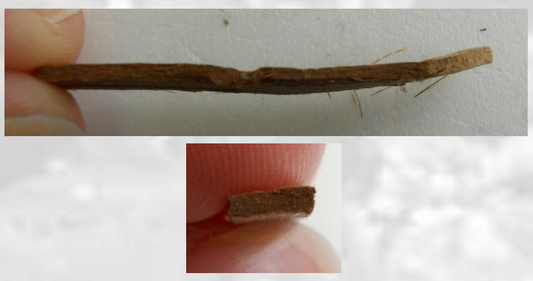
- Surface cool to touch, slightly damp
- Slightly flexible
- Not brittle
- No noticeable dimensional change
- Colour closest to new cedar bark
- Tendency to shed, friable surface
- Cannot use adhesives on treated object

Sucrose Treated Samples

- Rigid: if shaped when wet, should retain shape
- Not brittle
- Slight shrinking and warping
- Darkest colour
- Smooth surface, not sticky
- Not prone to shedding
- Adhesive use possible following treatment

Untreated Samples

- Rigid
- Brittle
- Very shrunken and warped
- Dark colour



PEG 400, 20% concentration, 23°C, degraded material, CPEG-D4

Gradual sucrose impregnation, 23°C, degraded material, GRT-D4

Untreated cedar bark, degraded material, CRT-D4

4-month Conclusions

- The gradual impregnation at room temperature produces the best results.
- The handling properties of sucrose treatment are different from PEG treatment.
- 4 months is not long enough for sucrose to penetrate all cells.
- Some cellular distortion takes place even after impregnation.
- The sucrose treatment is better than not treating the cedar bark.
- This research is not yet complete.

Acknowledgments:
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