Use of rare sugars for the conservation treatment of organic relics

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Yuichi Niwa, Professor, Kagawa University Faculty of Economics

Outline of technology

The sugar alcohol saturation method (Patent No. 3443463) is an effective method for the conservation of waterlogged organic relics (particularly wooden relics). For this method, elimination of impurities in crystallization of sugar alcohol is important, and this can be achieved by mixing a sugar with an anti-crystallization effect.

We examined the performance of D-psicose and allitol as an anti-crystallization agent. Although D-psicose was inappropriate as it was discolored to yellow at a high temperature, allitol was found to have properties similar to those of conventional anti-crystallization agents. Moreover, allitol was also found to be effective as a saturation enhancer for vacuum lyophilization. Since lactitol mixtures containing trehalose, which is a common anti-crystallization agent, are not suitable as saturation enhancers for vacuum lyophilization, allitol may well be a conservation treatment agent with the best overall properties.

Sales points

(1) Shows effects similar to those of trehalose as a hydrate inhibitor to be used in the sugar alcohol saturation method.
(2) Effective as a saturation enhancer for lyophilization.

Expected application fields and products

(1) Enhancers of conservation state
(2) Agent for conservation treatment of relics

Comparison with existing products

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<thead>
<tr>
<th></th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td></td>
<td>Hydrate inhibitor effect</td>
<td>Under intense vacuum</td>
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<tr>
<td>Allitol</td>
<td>High</td>
<td>Stable crystal</td>
</tr>
<tr>
<td>Trehalose</td>
<td>High</td>
<td>Pulverized</td>
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</table>

References, patents, etc.


Other matters to note

(Developer’s comment)

Today, the sugar alcohol saturation method is used for strengthening of wood materials for waterlogged excavated wooden relics at 50 Japanese organizations as well as in countries including China, Mexico, Germany, and Poland. Lactitol and trehalose used for the sugar alcohol saturation method are excellent in solubility, stability in high-humidity environments, stability against heat and organisms, and cost, and we have consistently used them for more than 10 years.

However, when their uses are widened to reinforcement of wooded materials in vacuum lyophilization, an improvement, i.e., control of hydrates in intense vacuum (crystals are pulverized due to dehydration), is necessary. Allitol evaluated in this study maintains the crystalline structure even in intense vacuum and may be a solution to the problem of the conventional method.

(Developer’s contact address)
TEL: +81-87-832-1921 E-mail: niwa@ec.kagawa-u.ac.jp