This invention relates to the manufacture of artificial sponges and more particularly to the manufacture of sponges having improved resistance to bacteria and fungi. Processes are already known for the production of artificial sponges from regenerated cellulose in which the sponges are treated with a disinfectant to prevent attack by bacteria and fungi.

According to one of the known processes, the artificial sponge of regenerated cellulose is treated with a reaction product of water soluble polyacrylic acids and quaternary ammonium compounds of high molecular weight.

The process treated in this manner are indeed highly resistant to attack by bacteria and fungi, but they have the disadvantage of losing part of their resiliency during use.

A process has now been found for the treatment of artificial sponges of regenerated cellulose as a result of which the sponges are likewise not attacked by bacteria and fungi. The sponges treated according to the process of the invention have the additional advantage that they retain their resiliency after prolonged use.

An object of this invention is to provide an improved process for treating sponges.

Another object is to provide an artificial sponge having increased resistance to bacteria and fungi attack as well as good resiliency.

Other objects and advantages will appear from the following flow diagram wherein the blocks connected by solid lines show the steps of the process and the dotted lines show the modified process in which the steps are reversed.

![Flow Diagram](image)

The process according to the invention is characterized in that the sponges are treated with a reaction product of carboxy methyl cellulose, or the alkali metal salts thereof, and a quaternary ammonium compound of high molecular weight.

The treatment of the sponges may be carried out in either of two ways.

The sponges may, for example, first be treated with a solution of carboxy methyl cellulose, or the alkali metal salts thereof, and then with a solution of a quaternary ammonium compound in water. The treatment may also be carried out in the reversed sequence.

It has been found that the reaction product of carboxy methyl cellulose and quaternary ammonium compound adheres to the regenerated cellulose. As a result the reaction product remains in the sponge during use and cannot be removed by water.

If an alkali metal salt of carboxy methyl cellulose is used according to the invention, sodium carboxy methyl cellulose is preferred.

Quaternary ammonium compounds with a germicidal action suitable for use in the invention include the following: cetyl trimethyl ammonium bromide, cetyl dimethyl ethyl ammonium bromide, stearyl trimethyl ammonium bromide, lauryl triethyl ammonium chloride, octadecyl dimethyl ethyl ammonium bromide, octadecyl dimethyl benzyl ammonium bromide, cetyl dimethyl benzyl ammonium chloride, lauryl dimethyl ammonium chloride, di-isobutyl cresolxy ethoxy ethyl dimethyl benzyl ammonium chloride. The invention will be further illustrated with reference to the following examples.

**EXAMPLE I**

Twenty-five artificial sponges produced from viscose were immediately after their production centrifuged. The centrifuged sponges were first treated with an aqueous solution containing 1.0% by weight sodium carboxy methyl cellulose with a viscosity of about four centipoises at 20° C.

The sponges were centrifuged and thereafter treated with an aqueous solution containing 1.0% by weight lauryl triethyl ammonium chloride. The sponges were then rinsed with water and finally again centrifuged.

For test purposes, the twenty-five treated sponges were used with twenty-five untreated sponges for an eight-month period of time for washing automobiles. Thereafter the sponges were judged on the following points: smell, resiliency, signs of attack and appearance. The results are as shown in Table I.

<table>
<thead>
<tr>
<th></th>
<th>Musty</th>
<th>Without resistance</th>
<th>Deteriorated</th>
<th>Damaged appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unreated Sponges</td>
<td>18</td>
<td>8</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Treated Sponges</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

**EXAMPLE II**

Twenty-five artificial sponges produced from viscose were treated with an aqueous solution containing 1% by weight di-isobutyl phenoxy ethoxy dimethyl benzyl ammonium chloride monohydrate. After centrifuging, they were treated with an aqueous solution containing 1% by weight sodium carboxy methyl cellulose with a viscosity of about four centipoises at 20° C. The sponges thus treated were then rinsed with water, centrifuged and dried.

The treated sponges were used for washing automobiles for eight months; at the same time, twenty-five untreated sponges were used for washing cars for comparative purposes.

The sponges were judged as described and results are given in Table II.

<table>
<thead>
<tr>
<th></th>
<th>Musty</th>
<th>Without resistance</th>
<th>Deteriorated</th>
<th>Damaged appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated Sponges</td>
<td>18</td>
<td>8</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Treated Sponges</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

What is claimed is:

1. In a process for the production of artificial sponges
of regenerated cellulose, the improvement comprising treating the sponges with a material selected from the group consisting of reaction products of carboxy methyl cellulose and a quaternary ammonium compound of high molecular weight, and reaction products of an alkali metal salt of carboxy methyl cellulose and a quaternary ammonium compound of high molecular weight.

2. In a process for the production of artificial sponges of regenerated cellulose, the improvement comprising treating the sponges with an aqueous solution of sodium carboxy methyl cellulose and then with an aqueous solution of lauryl triethyl ammonium chloride.

3. In a process for the production of artificial sponges of regenerated cellulose, the improvement comprising treating the sponges with an aqueous solution of di-isobutyl phenoxyl ethoxy ethyl dimethyl benzyl ammonium chloride and then with an aqueous solution of sodium carboxy methyl cellulose.

4. An artificial regenerated cellulose sponge containing a material selected from the group consisting of reaction products of carboxy methyl cellulose and a quaternary ammonium compound of high molecular weight and reaction products of an alkali metal salt of carboxy methyl cellulose and a quaternary ammonium compound of high molecular weight.

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