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ALIEN PROPERTY CUSTODIAN

PROCESS FOR THE BLEACHING OF CELLULOSES OBTAINED BY ALKALINE PROCESSES

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As a matter of fact cellulose obtained by alkaline processes, such as soda and sulfate celluloses can only be bleached with difficulty to yield a good white color without any loss of stability. All bleached soda or sulfate celluloses hitherto known do not fulfil the requirements with respect to the grade of whiteness or their stability has been attacked much more than with bleached sulfite celluloses. Some unrefined bleached kraft celluloses were recently handled showing a grade whiteness nearly similar to that of bleached sulfite celluloses. This progress, however, was due to undesired heavy losses in stability. The increase in the contents of white was only possible by boiling a special bleachable material with a considerably stronger grade of decomposition but also with greatly diminished qualities of stability. As further losses in stability are unavoidable in a bleaching, it is obvious that with a very strong chlorine bleaching the desired high figures of stability which are found otherwise in unbleached kraft celluloses would be entirely lost.

According to my invention I have found that it is possible to bleach celluloses obtained by alkaline processes in such a way that a material results, not only with a pure white color but also distinguished by a very good stability.

The invention relates to the treatment of celluloses with a combined bleaching method by utilizing hypochlorite and alkaline hydrogen peroxide solutions or peroxides respectively. The various steps of the hypochlorite bleaching and the peroxide bleaching may be varied accordingly. If desired, several bleaching steps with hypochlorite or peroxide may be combined in any variation.

According to my invention the raw material consists in celluloses obtained by alkaline processes, as for instance, soda celluloses or sulfate celluloses.

Furthermore I have found that it is advantageous to treat the cellulosic material before the real bleaching with elementary chlorine in the form of aqueous solutions of chlorine. By this process the bleaching treatment will be improved and accelerated. I may carry out my invention also with a combination of the combined bleaching with an acidification process. It is possible to acidify at the end of the whole treatment or after each bleaching step with hypochlorite or hydrogen peroxide or peroxides respectively. This acidification causes in many cases a specially intensified clarification, especially if some active chlorine is present from the last bleaching step. According to my invention the bleaching

means are firstly sodium hypochlorite or other hypochlorites, especially electrolytically produced bleaching lye and, secondly hydrogen peroxide or alkaline reacting peroxide solutions which form hydrogen peroxide, sodium percarbonate, sodium perpyrophosphate and the like. If hydrogen peroxide is used the bleaching bath must be made alkaline by addition of sodium carbonate, caustic soda or the like.

In many cases a special advantage was observed if, in general, the alkalinity of the bleaching bath, i. e. the baths containing hypochlorite as well as peroxide, was kept low. Too high an alkalinity may have a decomposing or harmful effect if molecular oxygen or air are present. The alkaline content of the bleaching baths should therefore not exceed 5 grs.—advantageously less than 2 grs.—calculated as sodium peroxide, per one liter of the bleaching bath.

My invention may be modified to a considerably extent. For instance, in the first step, the cellulose may be chlorinated in a usual manner with elementary chlorine whereby it has been observed that celluloses obtained by alkaline processes absorb the chlorine somewhat slower than sulfite celluloses. In consequence, the chlorine is added slowly and an excess thereof is kept for a longer time, for instance, 30 minutes in contact with the cellulose. When the chlorine is absorbed still slowly, the cellulose is treated with caustic soda either after a short washing to remove the main quantity of the formed hydrochloric acid and the excess of chlorine, or without any washing and finally washed out.

The second step may be varied likewise. One embodiment of my invention comprises the first treatment of the cellulose with hydrogen peroxide in an alkaline medium, i. e. with addition of caustic soda, lime and the like or sodium peroxide, during one or two hours at about 35-40° C., whereby even elevated temperatures, for instance, about 55° C. are allowable. The rate of peroxide is such that it is spent in this time. Thereafter active chlorine, for instance, in the form of a chlorine lime solution, is added to the cellulose and treated until the content of active chlorine decreases no more or only slowly. The material was then acidified and thoroughly washed. If desired, the material may be washed out after the peroxide treatment. With the acidification the material brightens usually extraordinarily.

An alternate method of proceeding in accordance with my invention consists in a preliminary bleaching with active chlorine in a known way

until the utilized chlorine is wholly or nearly wholly consumed. If desired, the material may then be washed for a short time and afterwards the peroxide added in the above described manner, the material is then treated for one to two hours and acidified without any washing.

The invention may be carried out also in the following way: the cellulose is treated accordingly with peroxide, acidified without washing out, whereupon the hypochlorite solution is added directly, either after a preliminary short washing or without any washing. The material is then treated according to my invention.

Or, the peroxide treatment may be inserted without washing between two treatments with hypochlorite, whereby the acidification is carried out only after the second treatment with hypochlorite, as described.

A further increase of the whiteness may be effected in such a way that in the third step the cellulose is treated respectively with active chlorine and/or peroxide, then acidified slightly, either with or without washing out, and finally washed out thoroughly.

In all cases a cellulosic material is obtained with a considerably increased whiteness in comparison with the hitherto known bleached soda and sulfate celluloses. The whiteness is nearly the same than that of highly bleached sulfite celluloses or even just the same. Which of the above mentioned variations is carried into effect, depends on the quality of the raw material.

The use of the peroxide bleaching bath ensures a considerable saving of chlorine at the bleaching with hypochlorite and furthermore a very remarkable sparing of the fibre in such a way that celluloses treated according to my invention maintain their high qualities of stability. Celluloses which are treated in such a way do not tend to yellowing or whenever only to a very low degree.

Examples

1. A finlandish kraft cellulose was chlorinated with 3,5% elementary chlorine, 3,5% caustic soda directly added and washed out. Thereafter the material was treated with 0,8% Na_2O_2 at 35° C., whereby the peroxide was spent after 1,5 hours, then added 2,5% hydrochloric acid, without preliminary washing out; immediately thereafter 0,25% active chlorine as calcium hypochlorite solution are added. The chlorine was entirely spent after 7 minutes, whereupon the material was washed. Now 1% active chlorine was added at 35° C.; after 4 hours 0,68% thereof was spent. Then the material was acidified directly with 2% hydrochloric acid and thoroughly washed.

2. Swedish soda cellulose was chlorinated with 2,7% of elementary chlorine, shortly washed, alkalisied with 1,3% caustic soda and washed. Thereupon 0,5% hydrogen peroxide and 0,5% caustic lime were added and the material treated at a temperature of 35–40° C. The peroxide was spent after one hour; 1,32% active chlorine was then added directly in the form of a chlorine lime solution. After 2,5 hours the chlorine was spent up to 0,24% whereupon the material was acidified without washing and finally the cellulose was washed down to a pH of 7.

3. German kraft cellulose was treated with 0,4% elementary chlorine, alkalisied and washed. Then 1% Na_2O_2 was added at 35° C. which was

spent after 1,5 hours. Now the material was acidified with 3% hydrochloric acid and immediately thereafter 1,0% active chlorine in the form of chlorine lime solution was added. The chlorine was spent after 15 minutes; afterwards the material was washed out. Then the material was treated once more with 1,5% active chlorine in an alkaline medium at 35° C. After 2,5 hours when only a trace of chlorine was yet to be found, the material was acidified and washed. Whilst the viscosity of the unbleached cellulose in a copper ammin solution was 944 CP, the bleached cellulose had a viscosity of 312 CP.

4. German kraft cellulose was treated with 4% elementary chlorine, as mentioned above, alkalisied and washed out, then treated with 1,5% Na_2O_2 at a temperature of 35° C. After 3 hours the peroxide was spent, whereupon the material was acidified and washed. Then the material was further bleached with 2% active chlorine at 35° C. and, after consumption of the main quantity of the chlorine, acidified.

5. A kraft cellulose was chlorinated with 6,5% elementary chlorine, shortly washed, alkalisied with 1% NaOH and thoroughly washed. Afterwards the material was treated with 1% Na_2O_2 at 35° C., until the peroxide was spent after 3 hours, then acidified and immediately 1% active chlorine as chlorine lime solution added. The chlorine was spent after 10 minutes. Now the material was washed out and further bleached with 1,5% chlorine at 35° C. After 6 hours 1,24% of the chlorine were spent, whereupon the material was acidified and washed out. The viscosity of the bleached cellulose was 431 CP, whilst the unbleached cellulose showed a viscosity of 1593 CP.

6. A kraft cellulose was treated with 0,5% Na_2O_2 at 35° C. without former chlorination. The peroxide was spent after 3 hours, whereupon the material was acidified and 1% Cl_2 added in the form of CaOCl_2 . After a duration of 5 minutes the chlorine was spent; the material was then washed thoroughly. The material was finished in the second step with 2,5% active chlorine at 35° C., acidified with hydrochloric acid and washed out.

7. After a preliminary chlorination with 6,5% Cl_2 the kraft cellulose was washed and alkalisied with 1% NaOH and again washed. In the second step 0,75% Na_2O_2 were added at the beginning and after its consumption 1% active chlorine was added. The chlorine was spent after 2 hours, whereupon the material was acidified with hydrochloric acid and then washed. In the last step 0,4% active chlorine were sufficient to obtain the desired high grade of whiteness.

8. The preliminary chlorination of a kraft cellulose required 1,6% Cl_2 . The material was washed shortly and alkalisied with 1% NaOH and again washed. Now the material was treated with 0,5% active chlorine and after the absolute consumption of the chlorine, the cellulosic material further treated with 0,3% Na_2O_2 . The cellulosic material was acidified with hydrochloric acid and washed. The finishing was made with 0,6% active chlorine, whereupon the material was acidified and washed accordingly.

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