Patented Apr. 19, 1932 1,854,331

UNITED STATES PATENT OFFICE

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PRODUCING PURE CELLULOSE FROM CELLULOSIC RAW MATERIALS

No Drawing. Application filed August 26, 1929, Serial No. 388,639, and in Canada April 12, 1929.

This invention relates to the production of pure cellulose from cellulosic materials, and more particularly to the refining of the cellulose after it has been separated from the major impurities usually associated with it in the raw materials.

The invention is chiefly concerned with the production of a cellulose, from which intermediate products, for the manufacture of rayon or so-called artificial silk, may be produced. It is thus an object of this invention to produce a cellulose from which there can be made rayon or the like having a whiter colour and a higher strength than that produced from cellulose heretofore used.

Wood pulp or similar cellulosic materials produced by well known methods are subjected in present practice to a purification process before being converted to xanthate from which the viscose, for the manufacture of rayon or the like, is produced. This purification process, known as mercerization, comprises treating the pulp with a solution of caustic soda or the like and thereafter pressing the pulp. This treatment is usually applied to the pulp in the form of loose sheets. In this treatment, however, all the hemicellulose and other impurities, such as resinlike substances, contained in the pulp are not removed. Approximately only about two-thirds of such impurities can be removed by this method.

Attempts have been made to remove the remaining impurities by washing the mercerized sheets with water, and, after pressing, subjecting the sheets to a further mercerizing treatment followed by pressing. These attempts have not been successful because the washing of the mercerized sheets with water causes them to swell to such an extent that they fall to pieces.

This invention makes it possible to overcome this difficulty and to substantially completely remove the impurities remaining in the material after mercerization.

It has now been found that the cellulose material can be readily treated and freed from remaining impurities by treating it, after mercerization, with an aqueous solution of sulphur dioxide or its equivalent in the form of sodium bisulphite or other alkali bisulphite. This treatment may be applied to the material in the form of sheets or to the pulp itself in the bleached or unbleached condition. It appears that the treatment with sulphur dioxide renders the impurities in the cellulose more readily soluble in water. Thus any salts formed during the sulphur dioxide treatment as well as hemicellulose and other impurities are readily removed by washing with water. The so treated material may be subjected to a further mercerization treatment to still further purify the same if necessary or desired. Furthermore, the invention may be applied by alternately treating the material with the alkali solution and the sulphurous acid until the desired degree of purity is reached.

When the treatment is applied to the pulp in the form of sheets, the sheets may be easily handled in the press. If desired, the pulp sheet from the drying machine may be passed continuously through the caustic alkali solution, and without intermediate washing with water, through an aqueous solution of sulphur dioxide. It is then washed with water, dried and cut into smaller sizes as usual.

In applying the invention to the pulp before it is formed into sheets, the pulp, in the bleached or unbleached condition, is treated in the usual way at normal or higher temperature with alkali solution and after only partially removing the alkali by draining or otherwise the pulp is subjected to treatment with the aqueous solution of sulphur dioxide or equivalent alkali bisulphite. The pulp is then washed with water.

The invention thus produces a cellulose having a high degree of purity, indicated by its high content of alpha cellulose and its low copper figure.

The following examples are given as further illustrative of how the invention may be carried out.

(1) Pulp sheets, which have been mercerized and pressed out in the usual way to leave in the sheets about 2 to 3 times their weight of caustic soda, are placed in an aqueous solution containing substantially 3 to 5% of sulphur dioxide. After all the alkali has

been neutralized, in say thirty minutes, the sulphur dioxide solution is removed and water added. The sheets are washed until all the sodium sulphite has been removed, then treated in caustic alkali solution, pressed and disintegrated in the usual way.

(2) Instead of completely washing the sheets after the sulphurous acid treatment above described, the sheets containing some sodium sulphite are mercerized, pressed and disintegrated as before.

(3) The sheet of pulp as it comes from the machine is conveyed through a trough or other chamber containing a caustic soda solution (about 17% NaOH), through one or more pairs of press rolls to remove excess caustic soda, and then through an aqueous solution containing substantially 3 to 5% of sulphur dioxide to neutralize the caustic soda. The sheet is then passed through further press rolls and finally through water. The washed sheet is then dried and cut to the desired sizes.

(4) Unbleached sulphite pulp cooked with, for example, a 3% solution of caustic soda at 95° C. is freed from the unabsorbed liquor by draining or otherwise and an aqueous solution of sulphur dioxide is added thereto to neutralize the alkali. The pulp is then washed with water and formed into the dry sheet in the usual way. If desired the pulp, after washing and before being formed into the sheet, may be treated with a cold solution containing, say, 5% caustic soda, after which it is thoroughly washed and formed into sheets as before.

If desired, a quantity of the sulphite salt may be left in the pulp in order to vary the ageing of the cellulose in accordance with the invention described in a companion application for patent Serial No. 388,640 filed of even date herewith and entitled, "Preparation of cellulose xanthate".

Obviously the pulp produced in accordance with the present invention may be used for the production of paper or any other purpose for which high grade cellulose is required, as well as for the production of rayon specifically mentioned.

This pulp has an abnormally high absorptivity. This may be illustrated by stating that 100 kg. of the pulp, when steeped in sheet form in a mercerizing caustic solution and thereafter allowed to drain under standard conditions, will contain over 850 kg. of the caustic solution, whereas other pulps will not absorb under the same conditions more than 700 kg. The pulp has a blotting-paper-like texture.

The term "aqueous solution of sulphur dioxide", as used in this specification and the appended claims, is intended to include aqueous solutions of the alkali bisulphites, as these may be used in place of the SO_2 solution and in certain cases they may be more readily available.

I claim:

1. A process for producing pure cellulose which comprises treating cellulose pulp with a mercerizing solution and treating the mercerized pulp with an aqueous solution of sulphur dioxide.

2. A process of producing pure cellulose which comprises treating mercerized cellulose pulp with an aqueous solution of sulphur dioxide and washing the pulp with water.

3. A process of producing pure cellulose which comprises treating mercerized cellulose pulp with an aqueous solution of sulphur dioxide, washing the pulp with water and then subjecting the washed pulp to the action of a mercerizing solution.

4. A process of producing pure cellulose which comprises treating cellulose pulp with caustic soda solution, removing excess liquor from the pulp, subjecting the pulp to the action of an aqueous solution of sulphur dioxide and washing the so-treated pulp with water to remove impurities therefrom.

5. A process as defined in claim 4, wherein said washing leaves a desired amount of sodium sulphite in the pulp.

6. A process of producing pure cellulose which comprises subjecting sheets of cellulose pulp to a mercerizing treatment, treating the mercerized sheets with an aqueous solution of sulphur dioxide and then washing the sheets with water.

7. A process as defined in claim 6, wherein the washed sheets are treated with a caustic alkali solution and dried.

8. A continuous process for the production of pure cellulose which comprises subjecting a sheet of cellulose pulp at any point during its progress through the sheet-forming machine to the action of a caustic alkali solution. treating said sheet with an aqueous solution of sulphur dioxide, washing the sheet with water and drying the same.

9. A continuous process for the production of pure cellulose which comprises mercerizing a sheet of cellulose pulp during its process of complete formation on the machine, subjecting the mercerized sheet to the action of an aqueous solution of sulphur dioxide, washing the sheet, treating the washed sheet with caustic alkali solution and washing the same with water.

10. A process as defined in claim 9, wherein the first mentioned washing is discontinued when the sheet contains only a desired amount of alkali bisulphite.

11. In the refining of cellulose pulp, the process which comprises mercerizing the pulp, treating the same with an aqueous solution of sulphur dioxide, washing the pulp with water and successively repeating these steps until the desired degree of purity of the cellulose has been reached.

12. As a new article of manufacture, a

cellulose pulp of abnormally high absorptivity, containing a high cellulose content and rendered substantially free from hemicellulose and other impurities by mercerizing the raw material, removing excess of the mercerizing alkali, subjecting the resulting product to treatment with an aqueous solution containing 3 to 5% of sulphur dioxide and washing the thus-treated product.

In testimony whereof I have affixed my signature.

R. DOSNE.