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BLEACHING

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6 Claims. (Cl. 8—2)

This invention relates to the treatment of ground wood or mechanical pulp and more particularly to the manufacture of products from such pulp as newsprint, specialty papers, boards, etc. Ground wood pulp, as is well known in the art, is produced by the mechanical disintegration of wood so that the pulp contains all of the lignins and resins, in fact all of the constituents of the wood. In view of all these compounds being present, the bleaching of ground wood pulp and the production of light paper therefrom presents a difficult problem. In my prior patent Reissue No. 19,470 of February 19th, 1935, I have disclosed the use of hydrosulphites as a bleaching agent for this purpose. I have now found that ground wood pulp can be lightened far more effectively and permanently by the use of compounds containing hydrosulphites in organic combination. The principal representatives of these compounds are given in the following:—

Sodium hydrosulphite formaldehyde	$Na_2S_2O_4 \cdot 2CH_2O$
Zinc hydrosulphite formaldehyde	$ZnS_2O_4 \cdot 2CH_2O$
Sodium formaldehyde sulphoxylate	$NaHSO_2 \cdot CH_2O$
Zinc formaldehyde sulphoxylate	$ZnSO_2 \cdot CH_2O$
Zinc formaldehyde sulphoxylate	$Zn\begin{matrix}SOCH_2OHO \\ SOCH_2OHO\end{matrix}$

While the above mentioned compounds represent the principal representatives of this group, I do not limit myself to this number, since for instance the formaldehyde in this combination can be substituted by any other aldehydes such as acetaldehyde or any ketone as acetone, or other ketone and the metal, sodium or zinc can be replaced by other metals as for instance potassium, calcium, magnesium or by the ammonium radical. The outstanding characteristics of these compounds are that they are very stable at ordinary temperature and that their bleaching effect is exerted only at high temperatures (above 100° F.) up to the boiling point of water.

In utilizing the process of my invention I either add the compound as a solid, in form of a solution to the material to be bleached or else I form the compound in situ in the material undergoing bleaching. Thus I have bleached ground wood pulp by adding to the hot pulp at about 180° F. zinc hydrosulphite formaldehyde or zinc formaldehyde sulfoxylate in small amounts. The pulp reduced quickly in color and finished with a considerably lighter and more permanent color than one bleached under similar conditions with hydrosulphite alone. I have also successfully bleached ground wood pulp by forming the hydrosulphite formaldehyde or the sulfoxylate directly therein by methods well known for manufacture of this material. For instance zinc hydrosulphite formaldehyde can be produced directly from zinc hydrosulphite and formaldehyde or from zinc dust, formaldehyde and a sulphite. Zinc formaldehyde sulfoxylate is produced readily from zinc hydrosulphite formaldehyde with additional zinc dust in an acid aqueous medium or in an alkaline aqueous medium without the zinc dust. The latter method is not as efficient.

In the manufacture of ground wood pulp, good use can be made by the heat generated in the grinding operation by adding the hydrosulphite directly to the water which is used in the grinder although the best source is not limited to this. The temperature in the grinder is usually above 140° F. and may go as high as 200° F. Under these conditions the bleaching process is usually completed in a short time. Depending on the type of pulp and the quality of bleaching agent used it may or may not be advantageous to add a washing step. The treatment to be used may be the same as that disclosed in my pending application, Serial No. 755,929, filed December 4, 1934.

As above indicated high temperature is essential in bleaching with these compounds and by utilizing the heat of the grinding operation this temperature is obtained without any additional cost although the pulp can be heated if desired artificially. The better results obtained with these compounds over inorganic hydrosulphites, especially the greater permanency of the color, easily offset the heating costs so that the bleaching step does not have to be confined to the grinding operation but can be practiced at any point in the flow of the pulp up to the paper machine proper whereat the pulp is hot.

The bleach occurs quickly, usually in less than half an hour. After the bleach, depending on the material, the pulp may be washed or directly converted into paper. It is to be pointed out that a pulp bleached with a sulphoxylate is many times more stable than one bleached with a hydrosulphite. For example, two batches of the same pulp were bleached at the same time, one with a hydrosulphite and the other with a sulfoxylate. After bleaching they were permitted to remain exposed to the air in their aqueous suspension. The hydrosulphite bleached pulp darkened quickly while the sulfoxylate bleached pulp did not darken until after nearly a week had elapsed.

With some wood pulps it is advantageous to wash after bleaching while with others it is not. The bleach herein disclosed can be substituted for the bleaching operation disclosed in my application Ser. No. 755,929 filed Dec. 4, 1934, and the wash can be optional as I have disclosed therein.

In general the bleach of this invention is useful wherever a quick lightening of color is desired at low cost. The materials useful in accordance with this invention are more satisfactory for high temperature bleaching than inorganic hydrosulphites inasmuch as they show a very marked increase in color lightening. This makes them useful in the production of newsprint from ground wood pulp as well as on press board products of board machines and specialty products. Since the bleach is very quick and yet effective it can be used to advantage on such products particularly as they have to be made at low unit cost because of the competition market existing.

It is an object of the present invention to provide a high temperature bleaching process for ground wood pulp.

Another object of the invention is to provide an improved process for the manufacture of a product of a light color from ground wood pulp.

The invention possesses other objects and features of advantage, some of which, together with the foregoing, will appear hereinafter.

One preferred operation is as follows:—

Wood suitable for production of ground wood pulp is passed from storage to a grinder wherein it is mechanically disintegrated. As is usual, the grinder is showered with water and this water stream carries the wood pulp away while cooling the grinder. The pulp stream has a temperature leaving the grinder of between 100° F.–212° F. and usually between 140° F.–180° F. This heat is supplied by the work done in disintegrating the wood, the water shower cooling the grind stone and thus providing the heat for the pulp stream. The temperature of the incoming water stream is usually between 32° F. and 80° F. At these temperatures the sulphoxylate is quite stable and exhibits little activity. It can therefore be manufactured and fed in easily with the water shower.

After the sulphoxylate has been added to the pulp, a short time must be allowed for its action to take place. This is usually only a matter of minutes, the sulphoxylate being added anywhere in the operation. Since the sulphoxylate acts by reduction, the pulp, after its color has been lightened, will darken if the pH is permitted to get much higher than 7.5 on the alkaline side. In connection with pH, the wood pulp is normally acid so that the pulp suspension is usually on the acid side initially. Under these circumstances, acidification need not be resorted to except when only a very alkaline water is available. Precautions against oxidation need not be taken ordinarily since the bleached pulp is quite stable, an unexpected result as well as an advantage over hydrosulphite bleaching which darkens readily on oxidation.

When the bleach has been completed, or while it is going on, the pulp may be subjected to compatible practices as screening, etc. The pulp can be washed after bleaching, if desired; for this a water slightly on the acid side is best used to avoid color reversion due to pH change and to secure the whitest paper. The bleached pulp with its coloring matter reduced can be run directly to the paper machine after its treatment and converted into paper. For this, sizing, coloring matter and diluents, as sulphite pulp, can be added as required.

The sulphoxylate added can be any of the usual sulphoxylates as a hydrosulphite formaldehyde, a formaldehyde sulphoxylate and reaction products of an aldehyde with hydrosulphurous acid or a salt thereof, particularly a metal salt as zinc or an alkali metal, sodium, potassium and ammonia, or one of the alkaline earths, calcium and magnesium. Various aldehydes can be used including acetaldehyde, formaldehyde and any of the other aldehydes or aldehyde compounds. The sulphoxylate can be formed virtually in situ by adding an aldehyde to water carrying a salt of hydrosulphurous acid. Thus, zinc dust and SO_2 can be added to the water. After a short time an aldehyde is added when the mixture is passed to the grinder shower. Instead of an aldehyde a ketone can be used. Both ketones and aldehydes form addition products with a hydrosulphite so that any aldehyde or ketone can be used. The simplest formula for an aldehyde and a ketone is

$$R-\overset{\overset{O}{\|}}{C}-R'$$

where R' is hydrogen for an aldehyde and any organic radical for a ketone wherein a carbon is bonded to the carbon in the formula. Any aldehydic or ketonic compound, aliphatic or cyclic, including carbocyclic as well as heterocyclic, within these formulas an be used as a basis for forming the sulphoxylate.

The invention is applicable to any stock containing an appreciable percentage of ground wood pulp. An example of such a stock is newsprint stock which is made up of ground wood and sulphite pulps. The problem of lightening color of such a stock is present due to the presence of the ground wood in an appreciable percentage. Such mixed stocks are included and are contemplated in my process and are therefore within the scope of the claims.

I claim:—

1. Bleaching ground wood pulp in the presence of an aldehyde and a hydrosulphite at above 100° F. and below 212° F.

2. Bleaching ground wood pulp at a temperature of about 140° F. with the addition product of hydrosulfurous acid and an organic compound of the formula

$$R-\overset{\overset{O}{\|}}{C}-R'$$

where R is any organic radical and R' is hydrogen or any organic radical.

3. Bleaching ground wood pulp at a temperature between 100°–212° F. with the addition product of hydrosulfurous acid and an organic compound of the formula

$$R-\overset{\overset{O}{\|}}{C}-R'$$

where R is any organic radical and R' is hydrogen or any organic radical.

4. Bleaching ground wood pulp with the addition product of a hydrosulfite and a ketone at a temperature between 100°–212° F.

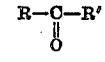
5. Bleaching ground wood pulp at a temperature of about 140° F. with the addition product

of hydrosulfurous acid and an organic compound of the formula



where R is any alkyl or aryl group and R′ is hydrogen or any alkyl or aryl group.

6. Bleaching ground wood pulp at a temperature between 100°–212°F. with the addition product of hydrosulfurous acid and an organic compound of the formula



where R is any alkyl or aryl group and R′ is hydrogen or any alkyl or aryl group.

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