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PROCESS OF TREATING GROUND WOOD

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The present invention relates to the bleaching of ground wood. More specifically the present invention relates to the bleaching of ground wood for use in the paper-making art.

5 The use of ground wood (i. e., a wood pulp formed by a mechanical process, e. g., a grinding process) has been materially restricted in the art. In fact prior to the present invention the use of ground wood in substantial proportions has been restricted for the most part to manu-
10 facture of papers of a limited or relatively low brightness. This applies generally to the ordinary coated as well as uncoated papers due to the influence of the base sheet on the brightness of the finished paper.

15 Ground wood due to its method of manufacture necessarily contains in addition to cellulose fiber various complex chemical compositions originally present in the wood. While it has been recognized for some time that these chemicals (which include organic materials such as lignin, tannin, sugars, etc. and inorganic materials such as the wood salts) have been responsible for the low brightness of ground wood papers, attempts
20 by prior investigators to solve the problem have met with limited success. Previous suggestions including various bleaching treatments have proved relatively unsatisfactory. For example, treatments of this type employing the previously suggested bleaching processes have been found to give only a limited increase in brightness, or to require so large quantities of expensive chemicals as to be commercially impractical.

25 The failure of the art to provide a commercially feasible ground wood of high brightness has long been a major problem in the paper industry. This is particularly true in view of the inherent advantages found in ground wood papers. Ground wood papers, for example (aside from
30 containing relatively inexpensive ground wood pulp), have improved printing properties and a better opacity compared to the so called chemical (cook) pulp papers, e. g., papers made from a sulphite pulp substantially free from lignin, tannin, etc. The improved printing properties, e. g., increased absorbency and smoother surface of the sheet (due primarily to the presence of the relatively short ground wood fiber) as well as the improved opacity are particularly important in the book, the magazine and the like paper art. The paper manufacturers have long desired a commercially practical ground wood treatment which would not weaken the wood fiber, materially decrease the opacity or deleteriously affect
35 the printing properties and at the same time pro-

vide a ground wood of the high brightness necessary to give the desired contrast in printing.

Therefore, the principal object of the present invention is to provide a commercially practical process for obtaining a ground wood of high
5 brightness having the desired "ground wood" properties.

Other objects will be apparent as the description hereinafter proceeds.

After a prolonged research investigation I
10 have discovered a method of treating ground wood free from the disadvantages found in the previously suggested treatments. In its broad aspect my invention is directed to a two step process which includes the initial treatment of
15 ground wood slurry with an alkaline peroxide solution followed by a subsequent treatment with an acid sulfite (SO_2) solution. The following example of a preferred treatment will serve for illustrative purposes.

Example

Ground wood slurry of about 3-8 per cent consistency (e. g., about 5 per cent) is treated
25 with an aqueous mixture containing about 0.5 to 2.0 per cent sodium hydroxide (e. g., 0.8 to 1.6 per cent) based on the weight of bone dry pulp, about 4 to 8 per cent sodium silicate based on the weight of bone dry pulp, and about 3-8 per cent hydrogen peroxide (e. g., about 4 per cent) based
30 on the weight of air dried pulp. (Per cent hydrogen peroxide refers to per cent 30% commercial hydrogen peroxide solution.) The bleaching slush having an initial pH value of about 10.5, is stirred occasionally to insure uni-
35 form mixing and allowed to stand for about 24 hours at room temperature, or for shorter periods at higher temperatures, e. g., 4-6 hours at 38°-42° C. The above procedure in which all of the chemicals are first mixed together and
40 then added to the ground wood represents the preferred method of operation. Other methods including the addition of the individual chemicals to the ground wood slurry may be employed if desired. My investigations indicate, however,
45 that the best results are obtained when the peroxide is added after the silicate buffer or preferably, as indicated above, added to the ground wood after admixture with the buffer.

After the peroxide treatment the pulp which
50 may or may not be separated from the peroxide bleaching liquor is then acidified to a pH value of about 4.5-5.5 (e. g., about 5) with sulphurous acid. If desired the acid sulfite treatment may be accomplished by using a mineral acid (H_2SO_4)

ok alum with a bisulphite or a hydrosulphite. The acid sulfite action is instantaneous, i. e., of the flash type, and the treated pulp is ready for immediate use. The pulp, for example, may be added directly to the beater furnish. If desired, the pulp may be stored under proper conditions for future use. No washing of the pulp is necessary in any stage of the present process.

It will be understood that the above example is merely illustrative and is not to be construed as limiting the present invention. If desired the initial bleaching treatment may be carried out in an alkaline peroxide bath using a metallic peroxide, e. g., sodium peroxide. The use of an alkali silicate, phosphate or like buffer with either hydrogen or alkali peroxide is, however, always preferred. The proportions of ingredients used may also be varied although my investigations indicate the optimum ratio of alkali hydroxide and sodium silicate to the specified hydrogen peroxide to be within the limits of the percentages of the preferred example.

The pH values of the solutions may vary somewhat although the use of a starting pH of around 10-11 in the peroxide reaction mixture is ordinarily preferred. On standing the pH value usually drops to about 9-10. The pH value after the addition of the acid sulfite should be between 3 to 6 at the end of the treatment. My investigations indicate that other reducing agents, such as oxalic acid, may be used in place of the preferred sulphurous acid or acid sulfite reaction mixture. The temperature which varies with the time of treatment (i. e., higher temperatures require shorter periods of treatment) should in most cases be kept below 45° C., for treatments at high temperatures, e. g., above 60° C. for 2 hours, cause a material loss in brightness. The optimum conditions for treating various type woods may be obtained by experimental tests.

The order of the peroxide and the sulfite treatments outlined above is of the essence. For example, a process calling for an initial sulfite treatment followed by a peroxide treatment fails to give the unique increase in brightness obtained by carrying out the treatments in the reverse order, i. e., the order called for by the present improved process. In addition, the process of the present invention calling for an initial peroxide treatment followed by a subsequent sulfite treatment does not necessitate the washing of the pulp at any stage of the process. The elimination of the washing step (a step ordinarily required in other treatments, e. g., a process calling for an initial sulfite treatment followed by a subsequent peroxide treatment) is of great importance. The washing of the pulp, for example, necessitates the use of additional costly equipment and generally results in the loss of substantial amounts of the desired short ground wood fiber. The present invention provides an efficient process making the use of expensive washing apparatus unnecessary.

The two step process of the present invention, although employing in the initial step relatively dilute and inexpensive peroxide solutions, makes it possible to raise the brightness of ground wood from 10 to 15 points as measured on the General Electric reflectance meter. The increase in brightness is of the relatively permanent type and papers, either coated or uncoated, made from ground wood treated in accordance with the present invention have an improved brightness and are for practical purposes substantially free from discoloration. Of

great importance the chemicals when used in accordance with the present invention have been found not to weaken the wood fiber or materially affect the desired opacity or printing properties of ground wood papers. The present invention provides a commercially practical ground wood of extremely high brightness and at the same time makes it possible to retain all of the inherent advantages found in the use of ground wood in the paper making art.

While I have illustrated the present invention with certain preferred modifications, it will be understood that the present invention is not limited thereto. All modifications falling within the spirit and scope of the present invention are intended to be covered by the following claims.

In the specification and claims the stated per cent hydrogen peroxide refers to the per cent of the usual commercial 30% hydrogen peroxide solution. Thus, for example, in the example the "3-8 per cent hydrogen peroxide" refers to use of the ordinary 30% solution, or to the use of 0.9-2.4 per cent H_2O_2 as such. As a further example in claim 8 the "about 4 per cent hydrogen peroxide" refers to the use of about 4 per cent of the commercial 30% solution, i. e., about 1.2 per cent H_2O_2 based on the weight of the ground wood. For practical commercial operation the per cent 30% hydrogen peroxide solution (i. e., the usual commercial solution) is referred to as "per cent hydrogen peroxide".

I claim:

1. The process of treating ground wood particularly adaptable for use in the paper-making art which comprises subjecting ground wood to the action of an alkaline peroxide bath and then subjecting the peroxide treated ground wood to an acid sulphite bath.

2. The process of preparing ground wood for use in the paper-making art which comprises subjecting ground wood to the action of an aqueous alkaline hydrogen peroxide bath and then subjecting the peroxide treated ground wood to an aqueous sulphurous acid bath.

3. The process of preparing ground wood for use in the paper-making art which comprises subjecting ground wood to the action of an aqueous alkaline sodium peroxide bath and then subjecting the peroxide treated ground wood to an aqueous sulphurous acid bath.

4. The process of preparing ground wood obtained by a grinding process for use in the paper-making art which comprises subjecting the ground wood to an initial action with an aqueous alkali hydroxide-peroxide bath and then subsequently subjecting the peroxide treated ground wood to an aqueous acid sulphite bath.

5. The process of preparing ground wood for use in the paper-making art which comprises subjecting ground wood to the action of an aqueous alkaline peroxide bath containing a peroxide buffer, and then subjecting the peroxide treated ground wood to an aqueous acid bath containing sulphur dioxide.

6. The process of treating ground wood for use in the manufacture of ground wood papers of high brightness, which comprises subjecting ground wood to the action of an aqueous bath containing sodium hydroxide, sodium silicate and hydrogen peroxide and then subjecting the treated ground wood to the action of an aqueous bath containing sulphurous acid.

7. The process of preparing ground wood of high brightness for use in the paper-making art which comprises subjecting ground wood to an

- initial treatment at a pH value of about 10-11 with an aqueous solution containing about 0.5-2.0 per cent sodium hydroxide, about 4-8 per cent sodium silicate and about 3-8 per cent hydrogen peroxide based on the weight of the ground wood, and then subjecting the peroxide treated ground wood to a subsequent treatment at a pH value of about 3-6 with an aqueous acid sulphite solution.
8. The process of treating ground wood which comprises subjecting ground wood to an initial treatment at a pH value of about 10.5 with an aqueous solution containing about 0.8-1.6 per cent sodium hydroxide, about 4-8 per cent sodium silicate and about 4 per cent hydrogen peroxide based on the weight of the ground wood, and then subjecting the treated ground wood to a treatment at a pH value of about 4.5-5.5 with an aqueous sulphurous acid solution.
9. The process of treating ground wood which comprises subjecting ground wood slurry of about

a 3-8 per cent consistency to an initial treatment at a pH value of about 10-11 with an aqueous peroxide bath, said initial treatment being carried out below 60° C., and then subjecting the treated ground wood to a treatment at a pH value of about 4.5-5.5 with an aqueous sulphite bath.

10. The process of preparing ground wood for use in the paper-making art which comprises subjecting ground wood slurry of about 5 per cent consistency to an initial treatment at a pH value of about 10.5 with a reaction mixture containing alkali hydroxide, a peroxide and a peroxide buffer, said initial treatment being carried out for several hours at a temperature of about 38°-42° C., and then subjecting the treated ground wood to a subsequent treatment at a pH value of about 5 with an aqueous sulphurous acid reaction mixture.

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