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PROCESS FOR THE TREATMENT OF WOOD

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This invention relates to the decortication and peeling of wood, by a process which renders the wood particularly receptive to subsequent treatments in the production of fibrous products.

In the preparation of fibrous materials from vegetable raw materials, it is becoming increasingly important to provide a high degree of whiteness and purity in the fibers. Mechanical and chemical purification and bleaching processes for such fibrous materials have been highly developed, with processing frequently being carried out in several stages. Normally, the wood is decorticated or washed before it is subdivided mechanically or chemically into fibers, and the bleaching process is carried out as a distinct step thereafter.

Previous decortication methods have not been satisfactory, and have reduced the efficiency of subsequent treatments. Contaminants not removed in the decortication follow through to finished products, which include fine writing papers. In some cases, the contaminants make it impossible to upgrade the fibers, and at best they make necessary a greater expenditure of chemicals for bleaching and other purification treatments.

For these and other reasons, it is important to remove as many of the natural impurities as possible from the fibers before they are bleached. However, it has been found in practice that this cannot be achieved without undue losses in fiber substance, or in other reduction of quality, for example, in the decolorizing of the fibers which occurs when they are pretreated with steam. Removal of steaming-induced brown colorants, or of bark and bark particles carried over from the wood, causes great difficulties in the treatment and application of the finished fibrous material. These contaminants often cannot be removed by the chemicals used for later processing, such as the peroxide used in bleaching.

The processing involved in decortication and peeling of wood also has presented a problem. For example, it has been considered necessary to treat the wood for a long time in a decortication drum and subsequently to sort the product by hand to eliminate poor grade materials. It also has been considered necessary to cut off the dirty faces of round timbers, thus providing considerable wood losses and additional labor.

It has now been found that the above difficulties can be avoided if wood, preferably undecorticated wood, is treated with aqueous solution of active-oxygen compounds in an about neutral to acid medium, and under superatmospheric pressures at temperatures below about 60° C.

Active-oxygen compounds such as H₂O₂, peracids, or their salts, for example peracetic acid and perborates, are compounds which liberate oxygen and are useful in the process of the present invention. They are employed as aqueous solutions in an amount to provide the amount of active-oxygen present in about 1–40%, and preferably about 3–20% of 100% hydrogen peroxide.

In the process of the present invention, it is not necessary to subject the wood to a mechanical treatment before it is contacted with the active-oxygen compound, as has hitherto been customary in the preparation of fibers. The process is preferably carried out on undisintegrated wood. However, the treatment can also advantageously be carried out on disintegrated wood, and results in better cleaning of the wood and removal of bark from it.

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The pressure applied in the present treatment advantageously will be about 4–15 atmospheres' gauge. The process is carried out at or around room temperature, normally at about 20° C. to 60° C. Under these conditions, a high concentration of chemicals can be obtained in the wood.

Operation at an acid or neutral pH makes it possible to compress large amounts of the present chemicals into the wood. When alkaline solutions are used, this is not possible because of the alkali-induced swelling of the wood. When the present acid or neutral solutions are compressed into the wood, a reaction begins within the wood whereby bark and bast, as well as other impurities still adhering to the wood, are forced from the surface of the wood.

Wood treated in this way can be freed from bark and bast in decortication tunnels much more easily than wood treated with steam according to known processes. A completely clean decortication is obtained even in branch positions, where rings of bark or bast often provide difficulty. As one desirable result of the present treatment the bast, which is very strongly bound to the wood, is forced off from within and hangs very loosely from the wood, so that it is very easily removed. When wood treated in this way is put into a decortication drum, it is possible to obtain complete decortication in a substantially briefer time than in the case of wood which for example has been pretreated with steam at 96° C. for four hours. The faces of the wood pieces are likewise cleaned, so that they no longer must be cut off and discarded as is customary where dirty wood is treated considerable saving in manpower and lessened wood loss.

The wood is advantageously impregnated with the present aqueous solutions of active-oxygen compounds in a pressure tank, for example, at about 4–15 atmospheres' gauge pressure for about 2–4 hours. Following this, it may be directly introduced into a decortication drum in which it is tumbled, and loosened bark and bast are abraded from it. Surprisingly, practically no active-oxygen loss due to decomposition results from this treatment, even with the application of a very highly concentrated peroxide. When alkaline solutions were used, for example in caustic bleaching processes, substantially larger losses result. This new process accordingly differs from past processes in that the peroxidic compounds liberating oxygen are applied in about neutral or weakly acidic solutions, preferably at room temperature and at an elevated pressure.

Woods pretreated by the present method are surprisingly clean. They are much cleaner than steam-treated wood, which is brownish and not completely free of bast, and therefore they introduce substantially no impurities into subsequent operations, such as bleaching. This means that the finished product is much cleaner and accordingly of greater quality both in appearance and physically.

A further advantage of the present process is that as long as the active-oxygen chemicals are present in the wood, a slow oxidation takes place even in a neutral or acid medium. It is known that the amount of oxygen liberation from these chemicals can be increased by raising the temperature, or by adding alkalies. Oxidation within the fiber structure can thus be accelerated at any desired time. Accordingly, due to the superior ability of the present neutral or acid solutions to penetrate the wood, chemical reactions can be caused to take place within timbers of substantially any thickness. These reactions have the surprising advantage that in addition to the expected bleaching which takes place, a marked disintegration of the fiber structure is provided. Accordingly, later disintegration is facilitated by the present treatment of the raw material, and at the same time a

qualitatively better fibrous material is obtained. It is important that milder conditions can be chosen for decomposition, due to presence of the active-oxygen compound in the wood. This especially affects the strength properties of the fibers obtained according to this technique. The application of such strong oxidation agents even in a hitherto unusually high concentration is not accompanied by injuries to the individual fibers.

Example 1

Five cubic meters of spruce wood was impregnated in a pressure tank made of refined steel with an 8% hydrogen peroxide solution at a pressure of 7 atmospheres' gauge pressure for 3 hours. After this treatment, the wood was decorticated and processed further in a decortication drum in a usual and known way. The product was clean and free of bast and bark.

Example 2

Five cubic meters of poplar wood was treated in a pressure tank with a 6% peracetic solution at room temperature and a pressure of 8 atmospheres' gauge pressure for two hours. The wood was then freed of bark and bast by means of drum decortication, and was then

processed in a four-press grinder to form mechanical wood pulp. The pulp was of high purity and free of bast and bark particles.

What is claimed is:

- 5 1. Process for the treatment of undecorticated wood, comprising impregnating the wood with a neutral to acidic aqueous solution of a peroxy-containing active-oxygen compound at a pressure of about 4 to 15 atmospheres and at a temperature below about 60° C.
- 10 2. Process in accordance with claim 1, wherein the treatment takes place at about room temperature.
3. Processes in accordance with claim 1, wherein an aqueous solution is employed which contains the peroxy-containing active-oxygen compound in an amount of about 1 to 40%, calculated as hydrogen peroxide.
- 15 4. Process in accordance with claim 3, wherein the peroxy-containing active-oxygen compound is present in an amount of about 3 to 20%, calculated as hydrogen peroxide.

References Cited in the file of this patent

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