

UNITED STATES PATENT OFFICE

LOGAN A. DILS, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG DILS, INC., OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE

PROCESS FOR TREATING WOODY MATERIALS TO OBTAIN FIBERS THEREFROM

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This invention relates to a process of treating woody materials, (that is to say, cellulose fibers cemented together by "lignin"), for the purpose of dissolving the lignin pectin, etc., so as to free the fibers, and obtain the same for paper making and other uses. The term "lignin" refers to a group of substances developed during the process of the plant growth, and which differ from the cellulose fibers in that they (the lignin substances) are soluble in certain solvents, such as dilute acids and dilute alkalis, in which solvents the cellulose fibers are not readily soluble.

There are three well known commercially practised processes for treating woody materials. One of these, known as the "sulphite process", is an acid process in which the wood is treated under pressure in an aqueous sulphurous acid solution or solution containing sulphites of the alkalis or alkali earth metals together with sulphurous acid. The strength of the acid solution varies within small limits according to the nature of the raw material. Generally stated, it contains about 3.5% free sulphur dioxide and 1.15% of sulphur dioxide in the form of sulphites of calcium and magnesium. By this process the "cooking", as the treatment is called, is done under a pressure of from sixty-five to seventy-five pounds per square inch, with temperatures ranging from two hundred and thirty to three hundred degrees, F., while the time of cooking varies from twenty-four to sixty hours.

Another process, known as the "soda process", is an alkaline process in which the woody material is subjected, under pressure, to the action of dilute aqueous caustic soda (8 to 10% caustic soda by weight). The pressures employed in this process vary from seventy-five to two hundred pounds per square inch with the temperatures at 330° F., to 380° F., the time of cooking varying from four or five hours to twelve hours.

The third process, known as the "sulphate process", is an alkaline process. A better name would be the sulphide process, since the digesting liquor to which the woody material is subjected contains chiefly sodium

hydroxide and sodium sulphide and small amounts of sodium carbonate and sodium phosphate. In the preparation of this liquor, possibly 5% caustic soda and 3 to 4% sodium sulphide, by weight, are employed and the cooking takes place under pressure of approximately one hundred pounds per square inch, and requires from two to six hours.

All of these processes are subject to the objections that the cooking takes place under pressure, requiring special apparatus for maintaining such pressure; and the time consumed ranges from two to sixty hours.

One of the objects of the present invention is to provide a process for cooking woody materials to free them from lignin and obtain the cellulose fibers for paper making and other uses, without the necessity of performing the operation under pressure, and to materially shorten the time consumed in the operation. Another object is to provide a process that will thus free the fibers from the lignin without injury to the fibers themselves.

With these objects in view, the invention consists in subjecting the woody materials for a short period of time, varying from fifteen to forty-five minutes, and at atmospheric pressure, to the action of an aqueous solution containing approximately 50% sodium hydroxide, by weight, and preferably a small percentage each of sodium thiosulphate, sodium borate, and sodium phosphate tribasic. It has been discovered that when woody materials, such as defiberized spruce, spruce chips, flax straw or bagasse, are subjected to this drastic caustic soda solution, the time required, under atmospheric pressure, for effectively separating the fibers from the enveloping lignin, without injury to the fibers, may be reduced to a period varying from ten to forty-five minutes, depending upon the character of the material under treatment. The length of time during which the woody materials are subjected to the cooking action will necessarily vary with the different woody materials under treatment. Thus flax straw can be effectively treated or cooked in about twelve minutes or even less with high temperatures, whereas spruce chips

would require from fifteen to thirty minutes, but the expert in the art can readily determine by inspection when the fibers have been cooked for a sufficient length of time to effectively free them from lignin.

While the percentages of the ingredients in the solution may vary within certain limits, it is preferred to form the solution in the following proportions:

	Per cent
10 Water.....	45.00
Sodium hydroxide, 76%.....	49.00
Sodium thiosulphate.....	1.25
Sodium borate.....	2.25
15 Sodium phosphate tribasic.....	2.50

to which may be added, if preferred, .5 of 1% of sodium perborate.

This solution is heated in an open vessel to a temperature of approximately 260° F., and the woody material is then placed therein. As indicated above, the length of time during which the woody materials are subjected to the action of this solution will vary with the character of the materials themselves. When spruce chips are subjected to the action of this solution and the latter maintained at a temperature of approximately 260° F. the fibers can be freed from the lignin in approximately eighteen minutes. Defiberized spruce will require treatment for approximately fifteen minutes, while flax straw will require only about twelve minutes, though with higher temperatures this time is greatly reduced. Bagasse should be treated for approximately one-half minute or less.

The outstanding characteristic of the invention lies in subjecting the woody materials at atmospheric pressure to a drastic solution of caustic soda, ranging from 40% to 55% but it will be generally found that a solution approximating 50%, or slightly less, of caustic soda will be efficient.

By the foregoing process one is enabled to produce fibers of the highest quality for paper making and other uses while the time element is greatly reduced, and this without the necessity of providing the expensive apparatus required when the cooking is done under high pressure. By this means a product of superior quality is secured in a minimum period of time, and the use of expensive apparatus is avoided.

What is claimed is:

1. The method of treating woody materials to obtain fibers therefrom for paper making and other uses, which consists in subjecting said materials to the action of an aqueous solution containing approximately 50% of sodium hydroxide by weight.

2. The method of treating woody materials to obtain fibers therefrom for paper making and other uses, which consists in subjecting

said materials to the action of an aqueous solution containing on the order of 50% of sodium hydroxide by weight.

3. The method of treating woody materials to obtain fibers therefrom for paper making and other uses, which consists in subjecting said materials to the action of an aqueous solution containing on the order of 50% sodium hydroxide and 3% sodium thiosulphate, each by weight.

4. The method of treating woody materials to obtain fibers therefrom for paper making and other uses, which consists in subjecting said materials for approximately eighteen minutes to the action of an aqueous solution containing on the order of 50% of sodium hydroxide by weight.

5. The method of treating woody materials to obtain fibers therefrom for paper making and other uses, which consists in subjecting said materials to the action of an aqueous solution containing on the order of 50% of sodium hydroxide by weight at a temperature of approximately 260° F.

6. The process of treating woody materials to obtain fibers therefrom for paper making and other uses, which consists in subjecting said materials to the action of an aqueous solution containing approximately 50% sodium hydroxide, 1.25% sodium thiosulphate, 2.25% sodium borate, and 2.5% sodium phosphate tribasic, each by weight.

7. The process of treating woody materials to obtain fibers therefrom for paper making and other uses, which consists in subjecting said materials to the action of an aqueous solution containing approximately 50% sodium hydroxide, 1.25% sodium thiosulphate, 2.25% sodium borate, and 2.5% sodium phosphate tribasic, each by weight, for a period of approximately eighteen minutes.

8. The process of treating woody materials to obtain fibers therefrom for paper making and other uses, which consists in subjecting said materials to the action of an aqueous solution containing approximately 50% sodium hydroxide, 1.25% sodium thiosulphate, 2.25% sodium borate, and 2.5% sodium phosphate tribasic, each by weight, for a period of approximately eighteen minutes at a temperature of approximately 260° F.

9. The process of treating woody materials to obtain fibers therefrom for paper making and other uses, which consists in subjecting said materials to the action of an aqueous solution containing approximately 50% sodium hydroxide, 1.25% sodium thiosulphate, 2.25% sodium borate, and 2.5% sodium phosphate tribasic, each by weight, at a temperature of approximately 260° F.

10. The process of treating woody materials to obtain fibers therefrom for paper making and other uses, which consists in subjecting said materials to the action of an

aqueous solution containing approximately 50% sodium hydroxide, and a small percentage each of sodium thiosulphate, sodium borate and sodium phosphate tribasic, each by weight.

5 In testimony whereof I have signed this specification.

LOGAN A. DILS.

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