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PRODUCTION OF CELLULOSE PULP

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This invention relates to the manufacture of cellulose pulp and has for an object the more efficient and economical manufacture of a superior grade of pulp, suitable for use in the paper, nitrocellulose, and other industries, by the processing of wood, corn-stalks, straw, bamboo, and other vegetable fibrous materials.

It is a further object of the invention to provide an improved process for manufacture of cellulose pulp from highly resinous woods.

These and other objects and advantages of the invention, which will more fully hereinafter appear, are attained by digesting the fibrous material with an aqueous liquor containing sulphurous acid, ammonium bisulfite, and calcium bisulfite. By this process I am able to secure a high grade of pulp from a variety of raw materials including especially woods high in resin content, such as, for example, jack pine, pitch pine, scrub pine, etc., which have been difficult, if not impossible, to process by the ordinary sulphite methods. Because of the good color of the pulp produced in accordance with the invention, economies in the usual bleaching operation are possible. The high strength of the pulp fibers makes the produce particularly valuable for paper manufacture and other uses, increases in strength of from 10 to 60% having thus been obtained. Other important advantages are more specifically hereinafter referred to.

The specific conditions of operation employed including, for instance, the temperature and length of cook, the strength of the liquor, the ratio of ammonium bisulfite to calcium bisulfite therein, may be varied depending upon the particular raw material under treatment and the desired quality of the product. I have found, however, that while the more resinous the raw material the higher the ratio of ammonium bisulfite to calcium bisulfite should be, generally speaking the best results are obtained when upward to about 50% of the combined sulfur dioxide is combined with ammonia (the balance with calcium). Under these conditions pulp of high strength is produced, little or no objectionable corrosion of digester linings results and, by reason of the high yield of more readily bleachable pulp, such economies are effected, as compared with previous methods, that the expensive recovery of ammonia—essential from economic considerations—in previous processes involving ammonia, may be dispensed with. In commercial scale operation of the invention very satisfactory results have been obtained when from 5 to 20% of the combined sulfur dioxide in the liquor was combined with ammonia.

The following examples are offered by way of illustration, although the invention is not limited to the examples.

Example 1.—100 parts by weight of hemlock chips, prepared in the usual way, are charged into a digester of any suitable type, such, for example, as a steel digester lined with lead or an inner layer of hard burned acid-resisting brick, which latter is preferably set in acid-resisting cement. To this charge is added 500 parts of a liquor consisting of 0.66% ammonium bisulfite, 3.25% calcium bisulfite, 2.8% sulfurous acid, and the balance water. In this liquor 16% of the combined sulfite was combined with ammonia and the balance with calcium. The temperature of the charge was gradually raised over a period of 4 hours to approximately 110° C. and then, in the course of 4 more hours to 140° C. The temperature was then raised to 143° C. and maintained at that point for an additional 3 hours. At the end of this digestion period the charge was blown into the blow-pit where the waste liquors were removed from the pulp. The pulp was subsequently washed, screened, etc. in the usual manner. Paper manufactured from this pulp showed an increase in strength of from 10 to 60% (by the several usual tests) as compared with that manufactured from the same type of wood by the usual calcium bisulfite process, using the same composition of liquor as above, except that the combined sulfite was all present as calcium bisulfite. About 14% less bleach was required, to give standard whiteness, in the case of the pulp made in accordance with the invention. The

improved pulp was also cleaner, softer, of a better color and "feel", and had superior beating and felting characteristics.

Example 2.—100 parts by weight of hemlock or spruce chips are charged into a suitable sulfite digester, together with 500 parts by weight of a liquor containing 0.37% ammonium bisulfite, 3.60% calcium bisulfite, and 2.56% sulphurous acid, and the balance water. 9% of the combined sulphur dioxide in the liquor is combined with ammonia, the balance with calcium. The temperature of this cook is gradually brought up to 145° C. over the course of several hours in accordance with usual sulfite cooking practice. The total time of the cook is 11 hours. After being washed, screened, etc. the pulp is made into paper of a very high quality showing an increase in strength of from 10 to more than 50 percent. (in the several usual strength tests) when compared with pulp produced under similar conditions by means of the usual calcium bisulfite process. The improved pulp was also cleaner, softer, and of definitely better "feel" color and beating characteristics.

Example 3.—100 parts by weight of jack pine chips were charged into a digester together with 500 parts by weight of a liquor containing 1.54% ammonium bisulfite, 2.75% calcium bisulfite, 2.68% sulfurous acid, and the balance water. 36% of the combined sulfur dioxide in the liquor was combined with ammonia, the balance with calcium. The temperature of the charge was gradually raised during the course of six hours up to 120° C. During the next four hours it was raised to 138° C. and maintained at that temperature for three hours. The washed pulp was of good color and free from objectionable pitch, was made white by less than the usual bleaching, and yielded a paper of superior grade.

In the practice of the invention as hereinbefore described it will be apparent to those skilled in the art that many important advantages are obtained, not the least important of which are a reduced time of cooking and improved digester control.

Various changes may be made in the method described without departing from the invention or sacrificing any of the advantages thereof.

We claim:

1. The process of manufacturing cellulose pulp which comprises cooking highly resinous wood with a liquor containing ammonium bisulfite, calcium bisulfite, and sulfurous acid.

2. The process of manufacturing cellulose pulp which comprises cooking vegetable fibrous material with a liquor containing ammonium bisulfite, calcium bisulfite, and sulfurous acid, upward to 50% of the combined sulfur dioxide in the liquor being combined with ammonia.

3. The process of manufacturing cellulose pulp which comprises cooking vegetable fibrous material with a liquor containing ammonium bisulfite, calcium bisulfite, and sulfurous acid, from 5 to 20% of the combined sulfur dioxide in the liquor being combined with ammonia.

In testimony whereof we affix our signatures.

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