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METHOD FOR MANUFACTURING RECONSTITUTED TOBACCO PRODUCTS

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This invention relates to a method for the preparation of finely divided tobacco suitable for the manufacture of tobacco sheets, and to improved reconstituted tobacco products.

The preparation of tobacco used for the manufacture of smoking products in the past has involved physical separation of the tougher components of the tobacco plant. During harvesting of the tobacco, the near-root portion of the stem, and undesirable foliage surrounding the choice leaves are cut away. During further processing the stem of the tobacco leaf is removed to prevent incorporation of the woody or straw-like material into the smoking product.

In the preparation of reconstituted tobacco wherein uniform comminuted material is essential to the formation of a strong sheet, smaller stem portions and veins of the tobacco leaf are filtered out or removed. The comminuted tobacco is admixed principally with cellulosic derivative binder and a plasticizer to obtain a strong, flexible sheet suitable for machine processing.

To comminute or grind tobacco down to fine-particle size, even when the coarser portions of the leaf have been removed, requires the expenditure of a comparatively large amount of energy and a long period of grinding. If it is desired to grind the tobacco particles to colloid-forming size, even more energy and longer grinding periods are required. When tobacco is ground to colloid-forming size particles, it has previously been disclosed that a stronger reconstituted sheet can be formed therefrom. However, the large amount of required energy and time for the preparation of colloid-forming size tobacco particles has limited its use for the preparation of reconstituted sheets.

It is a primary object of this invention to provide a method for the preparation of finely-divided tobacco which eliminates expensive tobacco leaf grading, sorting, separating and refining, and cuts waste in the tobacco industry.

It is an object of this invention to provide a method for the preparation of reconstituted tobacco which eliminates the necessity for moving portions of the tobacco plant as harvested.

It is an object of this invention to provide a method for the preparation of reconstituted tobacco wherein the energy and time required to obtain tobacco particles of colloid-forming size is greatly reduced.

It is an object of this invention to provide stronger reconstituted tobacco sheets.

These and other objects are accomplished in accordance with this invention which comprises first subjecting the tobacco to a mild hydrolysis treatment for the primary purpose of breaking-down or loosening the amorphous areas present in the tobacco. The preferred chemical treatment is acid hydrolysis of the tobacco to hydrolyze and help separate the amorphous and crystalline material present therein. The treated tobacco is then attrited to obtain material of fine particle size. Thereafter a sheet may be formed by casting a slurry of the attrited tobacco on a suitable surface and then drying to provide a self-supporting reconstituted tobacco sheet.

Tobacco as defined for this invention includes any type of tobacco as harvested from the field which is ungraded and contains all of the stem-portion and veins of the leaf. The stem and veins of the tobacco leaf contain greater amounts of natural binder which during hydrolysis is at least partially broken down and becomes more easily attritable. Of course, scrap and waste tobacco is also useful for this invention.

The hydrolysis of tobacco is carried out by treating it with any mineral acid capable of degradation of amorphous areas in tobacco. Treatment of the tobacco with hydrochloric acid and ferric chloride, with sulfuric acid and the like, are examples of acid hydrolysis procedures. Hydrolysis may be carried out with concentrated acid solutions for a short time or with dilute acid for a longer period, but, it is preferred, for plant scale operations, that the tobacco be subjected to from about 0.1 to about 1.0% aqueous solution of hydrochloric acid for about ½ to 2 hours at 200 to 300° F. in a pressure vessel.

Other means for degrading the hydrolyzable components of tobacco such as enzyme hydrolysis may be employed. However, the mineral acid treatment is preferred as less expensive and the acid will also degrade all hydrolyzable components present in the tobacco to provide tobacco material which is more easily and effectively attrited.

Generally, the ungraded tobacco with or without prior shredding is charged to a pressure digester along with water to provide a mass of from 10 to 40% solids. Preferably, during the period of hydrolysis, the tobacco is slowly mechanically agitated to obtain first a shredded material and then, as chemical breakdown of the tobacco proceeds, a disintegrated mass of tobacco of fairly small particle size corresponding, for example, to the hole size of about 100 mesh screen.

After hydrolysis, the mass may be neutralized and washed and drained from the digester into a colloid mill or the like to obtain a finely-ground tobacco containing colloid-size particles. However, it is preferred that the total mass of tobacco and juices be permitted to remain in the digester and neutralized with dilute alkali, e.g., sodium hydroxide, to precipitate a small amount of chloride salt. Other tobacco additives may be incorporated at this time. Then, the entire slurry is attrited by subjecting it to a high speed mechanical agitation or shearing operation, as in a colloid attrition mill, for at least several minutes up to about an hour, and then dried. Or, the slurry is diluted and spray dried in a procedure such as described in copending, co-assigned application S.N. 70,990 of J. E. Tucker, R. C. Alexander and O. A. Battista. If the slurry is disintegrated by mechanical agitation in a mill or the like, the mass will, in less than an hour, turn to a colloidal dispersion of gelatinous consistency. At this point in the process, additives may be incorporated by mixing into the gel. Peptizing or dispersing agents may also be incorporated. The gel is then either spray dried or extruded or cast on a suitable surface at the desired thickness and dried to form a sheet of reconstituted tobacco.

If the slurry is spray dried, it can be stored indefinitely in containers, it can be further processed, or it can be incorporated in a fluid medium to form a gel, and cast into reconstituted tobacco sheets. In general, spray drying involves the dispersion of wet particles of the hydrolyzed tobacco in a hot gaseous medium of sufficient temperature to evaporate the liquid from the particles, and then the removal of the dry particles from the gaseous medium. Spray drying can be carried out with or without accompanying attrition which may occur on collision of the particles with themselves or surrounding hard, solid surfaces. Briefly, the above mentioned application Serial No. 70,990 discloses a spray drying procedure involving centrifugally atomizing the hydrolyzed tobacco slurry within a chamber by a high speed rotary disk and forcing the atomized material into a whirling vortex by a turbu-

lent gaseous medium, preferably heated air. The hot gas current rapidly evaporates the moisture from the atomized slurry and transforms the tobacco particles into a dry powder. The attrited tobacco is then collected in a cyclone collector. Spray drying of the tobacco is used either with or without a prior mill grinding procedure. If some type of spray drying procedure is used, volatile or viscous additives should not be incorporated into the tobacco slurry until after the drying procedure is concluded in order to avoid losing the additive at the high drying temperatures or fouling-up the drying apparatus. When reforming a slurry of the attrited tobacco particles, the desired additive material can be added to obtain other useful advantages for the reconstituted sheet material.

In any event, attrition of the tobacco must produce colloid size particles and preferably particles of an average size of less than 200 microns and more preferably less than 40 microns. This type of attrition is critical to insure improved gelation and consequently a stronger reconstituted sheet.

At any stage of the process after hydrolysis, additives may be mixed with the tobacco. For example, additives may be added which improve smoking or burning properties of the reconstituted tobacco including siliceous material such as acid-treated clays, heat-treated montmorillonite, bentonite, and natural and synthetic silicates containing mobile hydrogen atoms, colloidal alumina, activated bauxite, light alumina hydrate, desulfated aluminum sulfate, etc. Flavorings, sauces, aroma materials, humectants and the like may be also introduced at this point. Such flavorings include invert sugar, licorice, chocolate, cocoa, fruit materials and pastes, aromatic oils and resins, maple syrup, vanilla, rum flavor and the like. Humectants or plasticizers usually incorporated in tobacco include glycerine, ethylene glycol, propylene glycol, sorbitol, dialkyl esters of dicarboxylic acids, etc. In addition, it may be found desirable to incorporate up to 20% of water-soluble polysaccharides such as cellulose ether derivatives or their salts, or sodium alginate to act as an additional binder for the reconstituted tobacco. Treatment of reconstituted tobacco sheets incorporating water-soluble polysaccharide derivatives as binding agents with cross-linking agents, for example, formaldehyde, precondensates of formaldehyde and polymers of aldehydes, serves to strengthen the sheets and reduce water solubility.

As an alternative to the addition of water-soluble binders to the tobacco for the purpose of strengthening the reconstituted sheets, the dried tobacco particles as obtained from storage after spray drying or wet attrited tobacco may be added to an alkali-soluble, water-insoluble polysaccharide solution such as water-insoluble cellulose ether or viscose solutions, and the tobacco extruded in sheet form into a coagulating bath to obtain strong, water-insoluble sheets of reconstituted tobacco containing from about 5 to 20% of the polysaccharide.

Once formed into reconstituted tobacco sheets the material is used as an inner wrapper for cigars. The sheet may be embossed to simulate the veined appearance of natural leaf and used as an outer wrapper for cigars. The sheet may be shredded and used in cigarette and pipe tobacco or as smoke filtering material for tobacco smoking products.

The following examples are set forth to demonstrate the method of this invention.

EXAMPLE I

Whole tobacco leaves were mechanically ground to fine particle size (about 200 mesh size). A portion of this finely ground material was hydrolyzed with 3.6% hydrochloric acid solution for 6 hours at 160° F. After hydrolysis the residue was filtered hot and washed with water to remove excess acid. The residue was diluted with water to obtain a mixture of about 5% solids and

this mixture was mechanically agitated in a Waring Blendor for about 25 minutes to produce gelation.

Sheets of reconstituted tobacco were prepared by mixing a portion of the hydrolyzed tobacco with 20% water-soluble carboxymethyl cellulose and 20% glycerine based on the mixture, casting the solution on a smooth surface and drying. Similarly, sheets were prepared from non-hydrolyzed finely divided tobacco of the original batch and the same amount of binder and plasticizer for comparison. Physical data obtained from both sheets are set forth in the following table.

Table I

Reconstituted Sheet	Ream Wt. (lbs.)	Breaking Length (Meters)	Elongation %	Thickness (mils)
Control Tobacco Sheet	46.1	608	14.8	3.2
Hydrolyzed Tobacco Sheet	25.7	836	10.0	2.5

As can be seen from the above table, thinner sheets of the hydrolyzed tobacco have greater strength characteristics than thicker sheets of non-hydrolyzed tobacco.

EXAMPLE II

To demonstrate that the method of this invention is useful for obtaining finely divided colloid-size particles of tobacco from whole leaves without grading or separation of stems and veins from the leaves, 36.4 grams of whole leaf, coarse Wisconsin tobacco, 1.75 cc. of concentrated hydrochloric acid and 149 cc. of water were placed in a pressure bomb reactor which was closed and placed in an autoclave. The above mixture gave a 0.5% acid solution which is the equivalent of 4.8% HCl based on the weight of the tobacco.

The temperature of the autoclave was raised to 240° F. for 95 minutes and then the reactor was permitted to cool to room temperature. Thereafter, the acid was neutralized with sodium hydroxide to a pH of 7.0. After neutralization the residue was diluted to a solids content of 15% and then attrited in a Waring Blendor for 45 minutes. This attrition completely broke down the particle size of the tobacco and gelation resulted. The entire mixture including retained tobacco juices was spray dried by introducing it into the hopper of a positive displacement pump which fed the slurry, at the controlled rate of about 3 lbs. of solids per hour, to a high speed spiraling air stream having an input temperature of about 680° F. The dried product was collected in a cyclone collector and had a moisture content of about 5%. The resulting material was very soft and light, and had an excellent tobacco aroma.

Microscopic examination determined that no fibrous bundles were present; all had been completely broken down into individual fine, fibrillar particles.

Reconstituted tobacco sheets were produced from this material by preparing an aqueous slurry of the dry tobacco particles containing about 10% solids and incorporating 20% carboxymethyl cellulose and 20% glycerine, casting the mixture on a smooth surface and drying. These sheets exhibited improved strength characteristics and closely paralleled natural leaf tobacco in texture, color and aroma.

Some of the advantages of the present invention are as follows:

(1) The whole tobacco leaf as harvested may be used to prepare reconstituted tobacco without the necessity of grading and separating portions thereof.

(2) The tobacco leaf, including the stem and veins, is more easily and effectively attrited due to the breakdown of the natural cellulose binder in the leaf by hydrolysis.

(3) A natural and stronger reconstituted tobacco sheet is provided due to improved gelation and the avail-

ability of a greater amount of natural binder from the stems and veins.

(4) The entire process of manufacturing the reconstituted tobacco, from harvesting the tobacco to casting the sheet, eliminates waste and expensive older processing steps to provide improved, less expensive tobacco smoking products.

Various changes and modifications may be made in practicing the invention without departing from the spirit and scope thereof and, therefore, the invention is not to be limited except as defined in the appended claims.

We claim:

1. A method of preparing reconstituted tobacco consisting essentially of treating tobacco with a dilute aqueous mineral acid solution to at least partially decompose the amorphous portions thereof, neutralizing the hydrolyzed reaction mass with dilute aqueous alkali, and then attriting the neutralized mass to form a material of gelatinous consistency.

2. A method of preparing reconstituted tobacco consisting essentially of treating ungraded tobacco with a dilute aqueous hydrochloric acid solution to at least partially decompose the amorphous portions thereof, neutralizing the hydrolyzed reaction mass with a dilute aqueous sodium hydroxide solution to precipitate a small amount of sodium chloride, and then attriting the neutralized mass to form a material of gelatinous consistency.

3. The method of claim 2 including spray drying the gelatinous material.

4. The method of claim 2 wherein the gelatinous mass is formed into a sheet and dried.

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