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PROCESS FOR PREPARING STARCH-PRODUCTS

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It is known to prepare dextrines by heating starch to a high temperature, if desired in the presence of small quantities of acid. In such processes the raw material to be dextrinized (eventually after a diluted acid has been added) is carefully dried, thereupon heated, cooled and moistened. The degree of moistening is chosen in such a way that the same corresponds with that of the product in an air-dry condition.

I have found that valuable products are obtained if the moist starch is allowed to absorb at low temperature gaseous acid or acid in the form of vapor, preferably in larger proportions as used in the known processes. Thereupon I leave the starch to which acid has been added to itself for some time at ordinary temperature or at somewhat increased temperature, e. g. 30–80° C. In the latter case the heating is carried out for such a small period that not too much water is evaporated and that the dextrine obtained contains about as mueh moisture or only not much less than is desired for a dextrine of good commercial quality. Thereupon the acid is removed in part or wholly e. g. by neutralisation by means of a suitable alkaline material, after which the product is ready for use.

The advantages of my process are appreciable. It is no more necessary to dewater the starch before the dextrinizing process. In some cases, however, it may be of advantage to apply a partial dewatering, e. g. when treating potatoes which may be dewatered to a moisture content of 10%. Often it is possible to dextrinize the air-dry flour directly without dewatering. A further advantage is that dextrinizing is carried out at lower temperature and no or only a limited drying is necessary, no moistening of the dextrinized product has to be carried out and all difficulties connected with such drying are removed. The latter two advantages cause that the chance of the formation of lumps and so-called "grit" is very small.

The advantage which is of the most importance consists therein that without any heating or with a limited heating dextrines of good quality can be obtained. Further it is remarked that the products obtained according to my process are of a very light colour, lighter than those products obtained in the known way.

I shall now elucidate my invention by means of some examples, which do not limit the scope of my invention.

Example 1

Potato flour containing 20% of moisture is brought into contact with dry hydrochloric acid gas at low temperature. The hydrochloric acid gas is quickly absorbed by the potato flour. The absorption is interrupted as soon as 2% HCl is taken up by the flour. After a shorter or longer period the acid may be neutralized. If the acid is neutralized immediately after the introduction the starch is dextrinized only very little. If the product is stored a few days at normal temperature the product obtains more and more the properties of white dextrine. The dextrinizing process may be promoted by gently heating the flour, e. g. at 50° C. After a few hours already a dextrinized product is obtained possessing the same properties as to solubility and viscosity as white dextrine. When heating a short time to 80° C., e. g. during 5 to 10 minutes, a starch product of a sufficient degree of dextrinisation is obtained, suitable for the textile industry.

Instead of 2% HCl, the product may also absorb smaller or larger quantities, e. g. 0.5%, 1%, 3%, 5%, 7% or more. When applying larger quantities than 2% it is advisable in general to remove the excess of moisture beforehand.

Example II

100 parts by weight of potato-flour are dried till the moisture content is about 12%. Thereupon a proportion of dry hydrochloric acid gas of about 3,5% is introduced while keeping the flour at a low temperature. After the absorption the product can be neutralized immediately or after some time. When the acidulated material is stored at about 30° C during e. g. 15 hours a noticeable dextrinisation takes place. Heating a short time at 50° C promotes the dextrinizing process considerably, no considerable drying out taking place during the treatment.

Instead of the potato flour mentioned also other starches or starch containing substances may be used, e. g. maize or corn starch, rice starch, tapioca starch, wheat starch, glutine, containing starches, such as wheat flour. Also starches pretreated in a known way may be subjected to my process, e. g. dextrine, and starches treated with oxygen-yielding means, or with ozone, halogene, hypochlorites, alkalies and the like. My process may be also applied to cold soluble starch, swelling starch and the like for which products treatment with gas or vapor seems to be the only one possible, in as much as the treatment with liquids gives rise to the formation of lumps. Inferior qualities of starch, such as cellulose or sand containing starch, may also be used with advantage, and also flour in the form of flakes.

Instead of hydrochloric and also other acids or

acid gas or vapor yielding substances or mixtures may be used, e. g. chlorine sulphonic acid, nitrogenic acid, SO_3, PCl_3, $PO\,Cl_3$, PCl_5, SO_2Cl_2, acetic acid and the like. Some of these substances must be converted into vapor by heating.

Example III

White dextrine obtained in the known way is allowed to absorb hydrochloric acid gas (containing no or little moisture) till the product contains 2% of free hydrochloric acid. The dextrine is moistened to a water content of about 12% beforehand. The acid-containing product is left to itself for sometime (varying from half an hour to some days) after which a suitable alkali e. g. sodiumcarbonate, bicarbonate, ammoniac, is used to neutralize the acid. The product obtained in this way has been dextrinized to a far further degree than the starting material, without the colour being changed to any extent.

Example IV

British gum obtained by roasting maize starch at high temperature, after being moistened with about 10% of water, is allowed to absorb hydrochloric acid or acetic acid during half an hour at 40° C., after which the excess of acid is neutralized.

Example V

Potato starch, treated with sodium hypochlorite in the known way, having a moisture content of 15%, is treated with hydrochloric acid till 2% is absorbed. Thereafter the product is gently heated during half an hour at 45° C. after which the acid is neutralized with a suitable alkali.

Example VI

Potato starch is dried till a moisture content of about 12% is obtained, i. e. the proportion corresponding with that of the desired final product in an air-dry condition. Thereupon the product is allowed to absorb 4% of hydrochloric acid gas and the product is heated during one hour at 40° C in a closed vessel at a pressure of about 5 atmospheres. Finally the product is neutralized.

One may apply my above process with advantage by firstly treating the starch as described above, thereupon neutralizing wholly or partially, and drying in the known way, and, finally, dextrinizing further by heating at high temperature. When applying a complete neutralisation after the pretreatment it is possible to dextrinize the product further by roasting in a neutral state or after having added to the product an acid, but in a small proportion.

Example VII

Tapioca "crack" flour in an air-dry condition is allowed to absorb 0.5% of dry hydrochloric acid gas; thereupon the acid product is left to itself during 10 hours at a temperature of 35° C. The product is neutralized and is heated during a longer or shorter period at about 130° C.

As to my process described above it can be stated in general that in order to attain the same degree of dextrinizing and when using a small proportion of acid the acidulated flour must be kept during a longer time on a given temperature than in using a larger proportion of acid. When using the same time and the same temperature a more dextrinized product will be obtained when using more acid. E. g.: when using more acid during 24 hours at a temperature of 35° C a very converted dextrine will be obtained and—if a higher temperature is preferred—it is necessary to heat only shortly, shorter than when relatively little acid is used, e. g. 0.5% calculated on the weight of the flour.

I may carry out my process in agitating or mixing vessels, which may be constructed so as to be cooled and/or heated. Also conveyor troughs, conveyor belts and the like may be used. It is also possible to have the flour brought into contact with a stream of gas, e. g. in a tower. The process may also be carried out in closed vessels with or without pressure, and the heating may be carried out also in such closed vessels.

Further it is remarked that the evaporation of water is also dependent on the thickness of the layer and whether the material is agitated or not. At the same temperature and when using a thick layer of resting flour, e. g. in a silo, less water will be evaporated than is the case when using a thin layer of flour which is agitated. In such cases where evaporation is to be limited I prefer to use thick layers.

If during the gentle heating some drying out might occur then it is advisable to add some moisture e. g. by atomizing water or by introducing moist air. Adding moisture during dextrinization is not only of importance for obtaining a final product with a sufficient moisture content but also to influence the dextrinizing process. In the absence of moisture my process is slower and goes on in a different way, than in the presence of moisture.

The products obtained according to my invention posess at least the same possibilities of use as those obtained according to known processes. In several respects my products are even better, e. g. as far as colour is concerned. The salt formed by the neutralisation is no drawback in most cases, and may be even of advantage, as the product will less stick together and will less give rise to the formation of lumps.

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