

ALIEN PROPERTY CUSTODIAN

PROCESS FOR THE PRODUCTION OF ALCOHOL BY FERMENTATION OF SULFITE WASTE LIQUOR OR WOOD-SUGAR MASH

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The fermentation processes for the preparation of alcohol made of fermentable carbohydrates which are industrially employed to a great extent have mostly utilised molasses, potatoes or other starchy material. Besides for a couple of years the waste liquor of the sulfite cellulose production and the so-called "wood-sugar mash" derived from the "saccharification" of wood are also increasingly used for this purpose.

It has been established that the yield of alcohol is increased when the alcohol is prepared by fermentation of sulfite waste liquor and/or wood-sugar mash and furthermore the duration of the fermentation is very essentially shortened which, for instance, makes it possible considerably to reduce in size the fermentation-room, if a small quantity of aneurin is added to the fermenting-mixture, simultaneously taking care that a certain, preferably considerable portion of the yeast-cells as long as possible contributes towards the fermentation of as many new parts of the fermenting solution as feasible.

In the place of aneurin can also be used the phosphoric acid esters, e. g. the mono- or pyrophosphoric acid compounds of aneurin as well as the cleavage-products or preliminary products of aneurin which are still efficacious in the tomato-root test, in other words the derivatives of pyrimidine or thiazol separately or in mixtures of both and with aneurin which are suitable for the formation of aneurin. The favourable action is already distinctly seen if approximately 1 mgm. aneurin or one of the other above-mentioned substances is added to 1 kg yeast (calculated in the form of compressed yeast containing 75% water) which acts during the fermentation. According to the circumstances, of course, also smaller or preferably larger quantities of the above-stated effective substances can be used. In practice it is advantageous to add these substances to the mash prior to the fermentation or to the yeast reconducted to the fermenting-system before mixing same with the mash.

The method of fermentation according to the invention is used for the production of alcohol made of sulfite waste liquor of leaf-wood and pines and their mixtures, furthermore made of wood-sugar mash, viz. sugar-solutions which are produced of cellulose-containing substances by "saccharification" according to one of the well-known methods.

The mash can be fermented discontinuously or in such a way as to be compulsorily and continuously conducted through the fermentation system. The undesirable settling out of the yeast

in the fermenting vat can be prevented in both cases by a mechanical stirring apparatus, rotation-pumps or other suitable means. Open or closed vats can be used in this case. It is appropriate to ferment under the atmosphere of carbonic acid, viz. under exclusion of air. It is sometimes even useful to work with an excess pressure of CO₂ which by way of example can be attained by carrying away the carbonic acid formed by the fermentation over a scrubber filled with water or an adjustable blow-off valve or something of that kind.

According to the invention work should be done under such conditions that a considerable portion of the yeast-cells participate in the fermentation as long as possible or gets in touch with new parts of the fermentative solution again and again by new use as "fresh yeast" or by carrying back the yeast-cells out of the fermented mash to the fresh mash. For this purpose arrangements according to a special fermentation method are suitable where the yeast is kept hold of by structures inserted in the fermentative solution or arrangements according to the method of reconducting the yeast, where the yeast is entirely or partly recovered from the mash completely or incompletely fermented by mechanical resource (e. g. centrifuge) and the recovered "yeast-milk" is again mixed with the fresh mash. When the methods of continuous fermentation are employed a part of or all the yeast is either permanently conducted in circulation through the entire fermentation system or the yeast-milk is for a short time stored in intermediate reservoirs for special treatment of the yeast, e. g. disinfecting, addition of substances which inhibit the vegetative property of yeast etc. before again mixing it with the new waste liquor.

Example I

When working according to the process by which the yeast is kept hold of by structures inserted in the fermentative solution by way of example, on the average from 7.600 to 7.800 l alcohol are produced by fermentation in 1.000 cbm. of neutralised waste liquor of sulfite cellulose containing 23-24% reducing substances (based on glucose). If 250-500 mgm aneurin are added to each 100 cbm mash, the fermentation lasts only 30 hours instead of 40 hours, and the output of alcohol is increased to an average of 7.800-8.100 l. For the fermentation of further amounts of liquid the quantity of the supplementary agent can be decreased. It is of special advantage to add aneurin all at once to the yeast

put in freshly when the inserted structures are exchanged. Similar results are obtained with aneurin-pyrophosphate or 2-methyl-4-amino-5-hydroxymethylpyrimidine hydrochloride. The method is also correspondingly applicable to the fermentation process of mixing the unfermented mash with mash which is entirely or partly fermented.

Example II

When sulfite waste liquor is fermented according to the fermentation method based on the conveyance of yeast using 15-25 kg yeast (containing 75% water) per cbm in a fermentation-room of 500 cbm, 25 gm aneurin or 2-methyl-4-

amino-5-bromo-methylpyrimidine-hydrochloride are added to the fermentation system. Only after weeks or months the addition will be made anew. The duration of fermentation is shortened and furthermore the yield of alcohol is increased on the average by 3% in comparison with the normal value. In case the fermentation process based on reconducting the yeast is carried out by using larger or smaller quantities of yeast than stated above, the quantity of the aneurin addition can be altered correspondingly. In the same way as described by the examples I and II the method can be employed for the wood-sugar mash.

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