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METHOD OF TENDERIZING ARTICLES OF FOOD

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This invention refers to the treatment of articles by chemicals and has particular reference to impregnating organic articles by means of enzymes.

The use of enzymes to effect tenderization of food, for assisting in the tanning and processing of leather and for the purpose of aiding in the processing of other organic articles is well known in the art. Enzymes such as papain or trypsin are usually suspended in a liquid water base solution and articles to be treated are dipped for a brief period into the solution. This method has serious disadvantages as the enzymes are applied in a highly concentrated form to the surface of the article thereby causing the surface of meat for instance, to become mushy, discolored, and spoiled at an accelerated rate, whereas the inside of the article remains substantially undisturbed until the chemical changes taking place on the surface of the article can penetrate to the interior.

To alleviate these shortcomings devices have been designed which comprise rollers incorporating hollow needles, the cavities within the needles being charged with enzyme solution. As the article to be treated is brought into contact with the rollers, the surface of the article is punctured and the enzyme solution is injected into the inside of the article. This method, although overcoming the surface problem, punctures and thereby damages the article. Moreover, this method injects the enzyme solution at discrete spots from which the chemical reaction must diffuse to the remaining area and to the surface.

One of the objects of this invention therefore is a new and improved method of impregnating articles by enzymes which avoids one or more of the disadvantages of prior art devices and methods.

Another object of this invention is the provision of means for obtaining substantially uniform penetration by enzymes of the article to be treated.

Another object of this invention is an improved method causing tenderization of an article of food by chemical means.

Another object of this invention is the provision of a method to accelerate processing of certain articles, as for instance, leather, without disturbing the shape of the article.

Another object of this invention is the provision of a method for treating articles by means of enzymes using compressive wave energy in combination with an enzyme solution to obtain impregnation of the article.

Other and further objects will be apparent from the following description of the invention.

Enzymes are well known in the field of organic chemistry and are used frequently for processing of organic materials. Enzymes, in broad terms, are catalytic agents, animal or vegetable, which are produced by living cells for the purpose of effecting chemical changes in absorbing or surrounding substances. Specific reference is made to "The Encyclopedia of Chemistry," by G. L. Clark, published by Reinhold Publishing Company, New York,

N. Y., 1957, and "Thorpe's Dictionary of Applied Chemistry," fourth edition, by J. F. Thorpe et al., published by Longmans, Green and Company, New York, N. Y., 1940, reprinted 1944.

When treating, for example, an article of meat for the purpose of tenderization, it is advantageous to prepare a solution which contains enzymes into which the article to be treated is immersed. A typical enzyme useable for this purpose is papain which hydrolyzes proteins. Another typical enzyme for articles of food is trypsin, sold under the trade name of "Tryptar" which may be used in the ratio of 250,000 units per 25 cubic centimeters of water. The article to be treated and also a magnetostriction sonic transducer operating at a frequency of 1 to 50 kilocycles is immersed into this solution and the transducer when energized causes compressive wave energy to repetitively bombard the article whereby the liquid acts as a coupling medium. In this manner, the liquid containing the enzymes is brought forcedly into intimate contact with the article and driven into the surface of the article so as to impregnate the article.

It will be understood that the type of enzymes, the frequency of sound energy, concentration of the solution, etc., recited above, is for illustrative purposes only and that the process will to a large extent depend upon the temperature conditions, duration of treatment, power of the sound energy, and type of article to be treated. Typical values for these parameters are approximately 250 watts per transducer head and an exposure of a few seconds at temperature ranging between 0 and 20 degrees centigrade. In an alternate design the article to be treated may be coated with a solution containing the enzymes using a dip, brush or spray coating process and then exposing the article to the sound energy whereby the transducer head may be in direct contact with the article or be caused to transfer its energy via another liquid or gaseous medium.

In a further and alternate design, the walls of a tank containing the liquid may be permanently lined with transducer heads and the article to be treated is dipped for a brief moment into the solution by means of conveyor means during which time the transducer heads are activated to produce sonic vibrations.

The transducers used to obtain compressive wave energy may be of conventional design and may comprise magnetostriction transducers, piezoelectric transducers, or other transducers which produce compressive waves in the form of sound energy as described for instance in U.S. Patent No. 2,806,246, issued September 17, 1957, entitled "Food Tenderizer" or in application for U.S. Letters Patent, Serial No. 537,720, filed September 30, 1955, entitled "Food Tenderizer," now U.S. Patent No. 2,830,912, issued April 15, 1958.

Transducers of the type indicated will produce vibrations in the sonic or ultrasonic frequency range. Satisfactory results will be achieved by the use of nickel type magnetostriction transducers driven from a source of electric energy at frequencies ranging from one to fifty kilocycles. It will be understood however that other types of transducers may be used without deviating from the principle of this invention.

When treating certain articles of food, particularly meat, flavoring extracts, such as hydrolyzed vegetable proteins may be added to the solution so as to improve the flavor thereby providing a still more palatable product.

While the method described above is well adapted for aging, tenderizing, tanning of leather, etc., by means of enzymes or flavoring of food products, it should be clearly understood by those skilled in the art that the same method and process may be used to attain improved, more

even and uniform penetration of porous articles by chemical substances in fluid form.

While there have been described certain embodiments of the present invention it will be apparent to those skilled in the art that many variations and modifications may be made therein without departing from the principle and spirit of the present invention which shall be limited only by the scope of the appended claims.

What is claimed is:

1. Method of tenderizing an article of food comprising the steps of applying an aqueous enzyme solution to the article and then treating said article with sound wave energy selected to be within the sonic and ultrasonic frequency range.

2. Method of tenderizing an article of food comprising the steps of coating the article with an enzyme solution and then treating the article with sound wave energy selected to be in the sonic and ultrasonic frequency range.

3. Method of tenderizing an article of food comprising the steps of immersing the article into an enzyme solution and then applying sound wave energy to said solution, said energy being in the sonic and ultrasonic frequency range.

4. Method of tenderizing an article of food comprising the steps of immersing the article into an enzyme solution and then applying sound wave energy to said article, said energy being in the sonic and ultrasonic frequency range.

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