Approximately 25 percent loss of potency was apparently incurred during flake-drying, probably due to absorption of atmospheric oxygen by the wet paste during the slow drying period. However, the dried product was completely stable at room temperature, within the accuracy of the assay method.

Example 4

This example illustrates dilution of aniline-trinitrobenzene complex in a starch matrix. The aniline-trinitrobenzene complex is a crystalline solid claimed to have merit as a rodent repellent. When diluted down in various media, it tends to bleach out on exposure. The following procedure was employed to give stable dilutions of 1 percent, 15 percent and 25 percent of this material. A mixture of 50 grams of 55-Scott hypochlorite-oxidized corn (maize) starch, 12.5 grams of corn syrup and 130 ml. of water was cooked until a homogeneous solution was attained. The aniline trinitrobenzene complex was finely powdered, and 0.6 gram of this material was stirred into the starch substrate to give a smooth and uniform dispersion, which was then dried out on a glass plate. Similar preparations were made with 10-gram and 20-gram additions of the complex. All three preparations were stable on storage over a period of several months as shown by no loss in color. An interesting feature is that these preparations (unlike the parent complex) had little or no odor, indicating immobilization of the complex.

Example 5

This example illustrates the incorporation of shortening in a dry, free-flowing starch matrix. Fifty grams of 55-Scott hypochlorite-oxidized corn (maize) starch was suspended in 120 ml. of water, cooked at 95° C. for 15 minutes with agitation, and 37.5 grams of regular corn syrup added. Twenty ml. of melted vegetable shortening (sold under the trademark "Crisco") was then emulsified into the paste which was subsequently coated and dried on glass plates. Similar preparations were made, but with the addition of 40 ml. and 60 ml. of the melted shortening. The dried products containing 20 and 40 ml. of fat were free-flowing and lacking in superficial "greasiness," while the product containing 60 ml. showed evidence of extraneous fat. Benzene extraction of the three samples removed 12 percent, 33 percent and 64 percent of the total fat, respectively. By means of this particular formulation as much as 32 percent of shortening (on the basis of the total composition) may be incorporated in a starch matrix to give a free-flowing and non-greasy dry shortening.

This application is a continuation-in-part of application Serial No. 378,419, filed September 3, 1953, now abandoned.

We claim:

1. A process of imbedding a water-insoluble material in a protective starch matrix in dry, free-flowing form to protect said material against chemical and physical changes, which comprises effecting a substantially complete solution of a chemically-modified starch, dispersing said material in said solution and drying the resultant dispersion and subdividing the dried product; said chemically modified starch having the following required characteristics: (1) being substantially completely soluble upon cooking in water to give a solution in which substantially no portion of the starch is present as swollen granules and fragments thereof, (2) having sufficient protective colloidal capacity to prevent any aggregation, separation and coalescence of the dispersed water-insoluble material, (3) forming clear aqueous solution substantially stable against retrogradation, (4) being capable of forming a coherent stable non-gummy film on being dried from aqueous solution, (5) having been suitably modified to yield aqueous solutions of considerably lower viscosity than pastes of untreated starch; said material being compatible with the aqueous starch system.

2. Process according to claim 1 wherein a plasticizer is added prior to the drying step.

3. Process according to claim 1 wherein an emulsifier is added to assist dispersion of said material.

4. Process according to claim 1 wherein said starch is a torrefaction dextrin.

5. Process according to claim 1 wherein said starch is a starch hydrolyzate having a D. E. value of about 4 to about 20 percent.

6. Process according to claim 1 wherein the drying is effected by spray-drying.

7. Process according to claim 1 wherein the resultant dispersion is formed into a thin layer and then dried.

8. Process according to claim 1 wherein said dispersion is mixed with a dry material prior to the drying step.

9. A process of imbedding a water-insoluble material in a starch matrix in dry form which comprises cooking an aqueous slurry of starch with mechanical agitation at a temperature above the normal gelatinization temperature of the starch so as to obtain a clear solution in which the starch molecules are mono-dispersed, dispersing in said solution a water-insoluble material and drying the resultant dispersion; said starch being oxidized starch having a Scott hot paste viscosity of about 90 to about 45 on the basis of 100 grams of starch in 280 ml. of water; said insoluble material being not adversely affected by the aqueous starch system.

10. Process according to claim 9 wherein said starch is etherified starch having a 5-gram alkali fluidity of about 60 to about 90.

11. Process according to claim 9 wherein the starch is a starch ester from the group consisting of acetylated starches and mixed carboxylic-sulfonic esters of starch.

12. Process according to claim 9 wherein said starch is thin boiling waxy starch.

13. A composition of matter stable to physical and chemical changes and in dry, free-flowable form comprising a continuous starch matrix in which is dispersed and imbedded a material not adversely affected by water and said starch matrix, said material being otherwise agglomerating and non-free-flowing; said starch matrix consisting of a chemically modified starch having the following characteristics: (1) being substantially completely soluble upon cooking in water to give a solution in which substantially no portion of the starch is present as swollen granules and fragments thereof, (2) having sufficient protective colloidal capacity to prevent any aggregation, separation and coalescence of the dispersed water-insoluble material, (3) forming clear aqueous solutions substantially stable against retrogradation, (4) being capable of forming a coherent stable non-gummy film on being dried from aqueous solution, (5) having been suitably modified to yield aqueous solutions of considerably lower viscosity than pastes of untreated starch; said material being compatible with the aqueous starch system.

14. A composition of matter stable to physical and chemical changes and in dry, free-flowable form comprising a continuous starch matrix in which is dispersed and imbedded vitamin A, said starch matrix consisting of a chemically modified starch having the following characteristics: (1) being substantially completely soluble upon cooking in water to give a solution in which substantially no portion of the starch is present as swollen granules and fragments thereof, (2) having sufficient protective colloidal capacity to prevent any aggregation, separation and coalescence of the dispersed water-insoluble material, (3) forming clear aqueous solutions substantially stable against retrogradation, (4) being capable of forming a coherent stable non-gummy film on being dried from aqueous solution, (5) having been suitably modified to yield aqueous solutions of considerably lower viscosity