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METHOD OF ENCAPSULATING WATER INSOLUBLE OILS AND PRODUCT THEREOF

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This invention relates to a method for the encapsulation of volatile materials and to the encapsulated products thus obtained.

This invention relates more particularly to the preparation and use of improved encapsulating dextrins and to the encapsulated products derived therefrom. It is the object of this invention to provide dextrins for use in the encapsulation of volatile materials such as flavoring oils and perfumes. A further object involves the preparation of encapsulating dextrins which are superior in their encapsulating ability to the dextrins and other materials heretofore employed for this purpose and which are, furthermore, free from the characteristic color, aroma and taste ordinarily associated with such encapsulating dextrins.

The use of volatile flavoring oils and perfumes in such applications as foods and cosmetics is often greatly hampered by the rapid evaporation and consequent loss of the volatile component. Thus, although the practitioner may prepare a food, cosmetic or other product which initially contains the appropriate degree of flavor or fragrance, the ultimate consumer often finds that there has been a considerable reduction in these properties. This loss will, of course, detract from the desirability as well as from the utility of the products concerned. In addition to foods and cosmetics, this problem is similarly encountered in other situations wherein it is necessary to entrap volatile substances as, for example, in connection with pharmaceuticals, detergents and the like.

Various techniques have been proposed in an effort to overcome this problem. These procedures generally involve the preparation of soild compositions containing the volatile ingredient entrapped therein. Such compositions may be prepared, for example, by mixing the volatile oil with a suitable absorbent base. In another method, the volatile materials are dispersed with so utions of various protective colloids, in which form they are then dried and ground.

Of late, the technique of spray drying has found wide acceptance as a means for preparing solid particles containing entrapped flavors, perfumes or other water-insoluble, volatile substances. In this technique the volatile oils are first emulsified in an aqueous solution or dispersion of a water-dispersible protective colloid such as gelatine, gum arabic, starch, or dextrin. This emulsion is then sprayed into a column of heated air or gases thereby evaporating the water from the emulsion. It is believed that the dry particles resulting from the spray drying process comprise a shell or capsule of the dried colloid, in which the oil is embedded or encapsulated in the form of minute droplets. The oil may also possibly be absorbed in the colloid base.

In addition to the spray drying procedure, other means of drying the above described emulsions have also been proposed. Thus, they may be spread on belts and passed through drying tunnels, or they may be passed over heated drums or the like. In all cases, however, spray drying and these other related drying techniques permit the practitioner to put volatile, water-immiscible oils or other substances into a solid, highly water-dispersible form which readily lends itself to blending with a wide

variety of other ingredients, while also offering protection against the evaporation of the volatile component from the dry particles. Among the possible applications for such encapsulated oil particles, one may list their use in foods, cosmetics, spices, pharmaceuticals, soaps, detergents, bleaches, and cleansers. Since any active ingredient may be thus entrapped, other suitable uses will be apparent to those skilled in the art.

As has been noted, dextrins are among the water-dispersible protective colloids which may be employed in the preparation of emulsions for use in spray drying. As is known in the art, dextrins are the conversion products formed by the incomplete hydrolysis of starch as a result of the action of dilute acids or by the heating of the dry starch. Although dextrins provide efficient encapsulating agents and are considerably lower in cost than such colloids as gelatin and gum arabic, their use in the preparation of spray dried perfumes and oils has, nonetheless, been limited. These limitations on the use of dextrins result from the charactertistic aroma, taste and dark color which are ordinarily associated with dextrins and which are, in turn, imparted to the resulting encapsulated, sray dried products.

Obviously the presence of this color along with the dextrin aroma and taste are highly undesirable in these spray dried products and particularly in the case of spray dried perfumes and flavoring oils. In an effort to alleviate this problem, attempts have been made to employ dextrins which have been subjected to a lesser degree of conversion so as to produce products which were lighter in color and which had a less pronounced taste and aroma. However, these mildly converted dextrins have not been successful as encapsulating agents since their encapsulating ability, as described in terms of the percent of volatile oil which is lost during the spray drying process, is considerably inferior to the more highly converted dextrins.

We have now discovered that the use of a particular type of dextrin as an encapsulating agent provides spray dried products which are free from the characteristic color, aroma and taste which have heretofore been associated with the use of ordinary dextrins. Moreover, our encapsulating dextrins have, surprisingly, been found to be superior in their encapsulating ability to these conventional dextrins as well as to various other encapsulating colloids such as gum arabic and gelatin. This superior encapsulating ability is believed to result from the finer particle size of the emulsions which are prepared from our encapsulating dextrins; this factor, in turn, resulting in spray dried products which exhibit a volatile oil loss substantially lower than that which is noted in the case of the spray dried products made with ordinary dextrins and other encapsulating colloids.

The encapsulating agents of our invention comprise dextrins derived from oxidized starches containing a controlled amount of carboxyl groups. These dextrins, in order to function efficiently as encapsulating agents in the process of our invention, should, preferably, have a total carboxyl group (i.e. —COOH) content of from 0.15% to 1.25%, by weight.

These carboxylated dextrins are, preferably, prepared from oxidized cereal starches such as corn, wheat, waxy maize and waxy sorghum starches. Carboxylated dextrins derived from oxidized root starches, such as tapioca and potato starches, may also be employed where desired by the practitioner. However, although the latter materials are less efficient in their encapsulating ability as compared with the carboxylated dextrins derived from oxidized cereal starches, these carboxyl containing root starches are, nonetheless superior in their encapsulating ability to carboxyl free dextrins prepared from the