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3,520,949  
**HYDROPHILIC POLYMERS, ARTICLES AND  
 METHODS OF MAKING SAME**

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2 Claims

**ABSTRACT OF THE DISCLOSURE**

The invention relates to the preparation of a hydrophilic cross-linked polymer which comprises admixing a water soluble polymerizable hydroxyalkyl monoester of a mono-olefinic monocarboxylic acid and a polymerizable diester of a mono-olefinic monocarboxylic acid in the presence of a linear polyamide.

This invention relates to novel hydrophilic polymers and processes of making same and has particular relation to such hydrophilic polymers in the form of casting syrups, friable solid foams and in powdered form, the latter form being particularly adapted as a carrier for medicinally-active substances and for natural and synthetic flavors, essences, fragrances, spices, food colors, sweeteners, dyes and the like.

It is known to produce hydrophilic polymers, particularly to produce cross-linked hydrophilic polymers and, more particularly, to produce same in the form of shaped body hydrogels in an aqueous solution by copolymerization whereby a major portion of a monoester of acrylic or methacrylic acid with a bi-functional alcohol which has an esterifiable hydroxyl group and at least one additional hydrophilic functional group is copolymerized in aqueous solution with a small amount of a diester of these acids and of an alcohol which has at least two esterifiable hydroxyl groups (see U.S. Pat. Nos. 2,976,576 and 3,220,960).

It is known that said prior art shaped body, hydrophilic polymers prepared in an aqueous system are carriers for medicinally-active substances. Thus, it is known that medicinally-active substances may be dissolved in the aqueous constituent of such prior art shaped body hydrogels to provide gradual release of the medicinally-active substances; however, the resulting solutions are difficult to handle and store and the medicinal components are susceptible to air oxidation, degradation, deterioration, evaporation, etc.

Heretofore, it has been necessary to prepare a solid or shaped body of the hydrophilic polymer and thereafter dissolve in the aqueous constituents of such shaped body the medicinal flavor, sweeteners, coloring agent and the like. Additionally, in the prior art preparation, employing copolymerization in an aqueous solution, it has not been possible to directly prepare a foam by the addition of the usual foaming agents, such as sodium bicarbonate, for the reason that a soft semi-gelatinous hydrogel product resulted rather than the desired hard friable foam and it was not possible to convert such semi-gelatinous product to a friable foam or to a compactable powder.

In addition, the said prior art process employing the conventional redox catalyst such as sodium bicarbonate

and ammonium persulfate, potassium sulfate, sodium thio-sulfate and ammonium persulfate or potassium sulfate, caused the polymerization reaction to go to completion at temperatures above 0° C. thereby preventing the preparation of a prepolymer preferably in the form of a liquid casting syrup which is capable of being dyed, pigmented, thickened and otherwise varied in form and thereafter cured to form solid or shaped bodies such as rods, sheets, tubes and other molded articles; or a hard, friable foam as will be hereinafter further described.

It now has been found that hydrophilic polymers can be prepared in a water-free system so as to permit the direct preparation of liquid casting syrups in prepolymer form which can be used for direct in situ polymerization in the form of castings of shaped bodies, films and coatings, which can be treated with conventional foaming agents such as sodium bicarbonate to result in hard, friable foams which can be directly formed into the swelled state or ground directly to powder form.

It also has been found that hydrophilic polymers can be prepared in a water-free system so as to permit ready preparation of the hydrophilic polymer products in powdered form. An object of the present invention is to prepare said hydrophilic polymers in a water-free system to permit their direct conversion to a powdered foam whereby the powdered polymers are especially adapted as carriers for medicinally-active substances, natural or synthetic flavors, essences, fragrances, spices and the like. The polymeric powders of the present invention have been found to be compact in form and have been found to provide the necessary stability and shelf life to enable their use as carriers for medicinal and flavoring substances which are susceptible to chemical reactions such as air oxidation, deterioration, evaporation and degradation.

A further advantage derived from the compactness ability of the instant powdered hydrophilic polymers is that upon encapsulation of the said powder carrying medicinally-active substances, flavors, essences and the like, greater stability and longer shelf life are provided than was heretofore possible.

Polymeric powders containing encapsulated flavors, essences or spices can be reconstituted in solution at will, thus providing superior flavoring solutions because encapsulation prevents air deterioration of the flavoring component and also prevents losses due to evaporation.

The liquid casting syrups of this invention are prepared by mixing a major amount of suitably purified commercial polymerizable monoester of an olefinic acid containing at least one substituted hydrophilic functional group with a minor concentration of a free-radical catalyst and heating from ambient temperature to 80° C. until the monomer no longer shows water solubility. This product is then cooled to room temperature and addition of theoretical catalyst content carried out. The casting syrup can then be suitably dyed and pigmented and the fluid viscosity increased as desired by addition of appropriate thickening agents.

The casting syrup can then be cured to form products capable of being cast, formed or machined into rods, sheets, etc., for various uses. The product can exist in a rigid state, swelled state or as a foam. The polymer obtained from the cured casting liquids has good mechanical strength, reversible fluid absorption properties, the