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3,574,822

POWDERED COSMETICS OF HYDROPHILIC HYDROXY LOWER ALKYL ACRYLATES AND METHOCRYLATES

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ABSTRACT OF THE DISCLOSURE

Cosmetic preparations such as powders, and the like are prepared by adding a powdered hydrophilic acrylate or methacrylate polymer to the selected powdered cosmetic ingredients. The hydrophilic polymer can be cross-linked.

The present application relates to novel cosmetic preparations.

The present application is a continuation-in-part of application Ser. No. 567,856, filed July 26, 1966, now U.S. Pat. 3,520,949, and application Ser. No. 654,044, filed July 5, 1967, and application Ser. No. 650,259, filed June 30, 1967, now abandoned.

Cosmetic manufacturers have sought in the past to produce compositions for use on human hair and skin which may be easily applied, exhibit no detrimental effect on the skin and retain their stability for a reasonable period of time. Some progress has been made in producing products of this type. However, there remains inherent defects in prior preparations such as creams, lotions, shampoos, dressing, sticks, and the like which impairs their cosmetic effectiveness. One example of this is the well-known tendency of conventional mascara to run when wet by tears or water.

As is well known the various creams used on the body have a tendency to soil clothing, bed clothes and the like. Lipsticks and suntan creams have a tendency to be greasy and essences (e.g. perfume) and other volatile components present in lipstick, creams and lotions have a tendency to be lost on standing.

It has hitherto been proposed to employ lacquers for imparting a temporary set to the hair. However, since lacquers include a water-insoluble film-forming ingredient, it has been extremely difficult to remove them from the hair. When it is desired to change the hair style, it sometimes becomes necessary to employ a special solvent or a powerful detergent composition, neither of which is readily available in the home. Lacquers have generally been considered unsatisfactory for application to the hair for this reason. A number of water-soluble film-forming resinous materials have also been proposed for application to the hair in order to set it. However, such water-soluble materials have not been completely satisfactory because of the tendency for the resultant film to become tacky and for the hair to lose its set when exposed to conditions of high humidity.

Furthermore, at present there is no satisfactory method for straightening kinky hair.

Accordingly, it is an object of the present invention to prepare novel cosmetic compositions.

Another object is to improve the application of cosmetic compositions to the body.

An additional object is to overcome the tendency of mascara to run when wet.

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A further object is to protect the body against the drying effects of cosmetics comprising alcohol solutions.

Yet another object is to overcome the greasiness present in various cosmetic creams, sticks, and lotions.

A still further object is to reduce the staining or soiling property of cosmetic creams and lotions.

An additional object is to reduce the loss of flavors or essences from cosmetic compositions.

A corollary object is to develop cosmetic compositions which release a flavor or essence when wet.

An important object of the invention is to straighten kinky or curly hair so that it can be manipulated as desired.

A related object is to set hair of any type.

A further object is to develop a hair setting composition and method which will provide a "permanent" set even under conditions of high humidity.

A related object is to give hair a "permanent" that does not result in the treated hair developing static electrical charges under conditions of low humidity.

Another object is to apply a film having one or more of the above characteristics in relation to hair, but which can be readily removed.

A still further object is to develop novel aerosol compositions useful for application to the body.

Still further objects and the entire scope of applicability of the present invention will become apparent from the detailed description given hereinafter; it should be understood, however, that the detailed description and specific examples, while indicating preferred embodiment of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

It has now been found that these objects can be attained by employing certain hydrophilic acrylate and methacrylate polymers in cosmetic compositions. For liquid cosmetics the hydrophilic polymer should not have substantial cross-linking (i.e. the cross-linking should not be sufficient to render the polymer insoluble in the solvent) while for powdered or creamy compositions cross-linked copolymers can be employed.

The term cosmetic is intended to embrace all types of products which are to be applied in any manner directly to the person for the purpose of cleansing or embellishment, including altering the appearance. Toilet soap and shaving soaps and creams are intended to be included in this definition as well as deodorants, depilatories, suntan and sunscreen preparations.

The hydrophilic monomer used to prepare the hydrophilic polymer is preferably a hydroxyalkyl monoacrylate or methacrylate such as 2-hydroxyethyl acrylate, 2-hydroxyethyl methacrylate, diethylene glycol monoacrylate, diethylene glycol monomethacrylate, hydroxypropyl acrylates and methacrylates, e.g. 2-hydroxypropyl acrylate, 2-hydroxypropyl methacrylate, 3-hydroxypropyl acrylate, 3-hydroxypropyl methacrylate, tetraethylene glycol monomethacrylate, pentaethylene glycol monomethacrylate, dipropylene glycol monomethacrylate, dipropylene glycol monoacrylate. Acrylamide, methacrylamide, diacetone acrylamide, methylolacrylamide and methylol methacrylamide also are useful hydrophilic monomers. The most preferred monomer is 2-hydroxyethyl methacrylate and the next most preferred monomer is 2-hydroxyethyl acrylate.

In preparing hydroxyalkyl acrylates and methacrylates a small amount of the diacrylate or dimethacrylate is also formed. This need not be removed as it does not cause undue cross-linking.

When it is desired to shampoo out the hydrophilic polymer there are desirably included 0.1 to 15% of an ethyl-

enically unsaturated acid to provide free acid groups. Typical examples of such acids include acrylic acid, methacrylic acid, itaconic acid, aconitic acid, cinnamic acid, crotonic acid, citraconic acid, measaconic acid, maleic acid and fumaric acid. Less preferably there can also be used partial esters of polybasic acids such as mono 2-hydroxypropyl itaconate, mono 2-hydroxyethyl itaconate, mono 2-hydroxyethyl citraconate, mono-2-hydroxypropyl aconitate, mono 2-hydroxyethyl maleate, mono-2-hydroxypropyl fumarate, monomethyl itaconate, monoethyl itaconate, mono methyl Cellosolve ester of itaconic acid (methyl Cellosolve is the monomethyl ether of diethylene glycol), mono methyl Cellosolve ester of maleic acid.

The use of such acid containing groups does not result in substantial cross-linking unless the polymer is heated for a substantial time above normal operating conditions for cosmetics or unless the polymerization time is prolonged using relatively high amounts of catalysts.

When cross-linked or cross-linkable hydrophilic polymers are prepared normally the cross-linking agent is preferably present in an amount of 0.1 to 2.5%, most preferably 0.1 to 1.0%, of the total monomers, although up to 15% of cross-linking agent can be used. Typical examples of cross-linking agents include ethylene glycol diacrylate, ethylene glycol dimethacrylate, 1,2-butylene dimethacrylate, 1,3-butylene dimethacrylate, 1,4-butylene dimethacrylate, propylene glycol diacrylate, propylene glycol dimethacrylate, diethylene glycol dimethacrylate, dipropylene glycol diacrylate, divinyl benzene, divinyl toluene, diallyl tartrate, allyl pyruvate, allyl malate, divinyl tartrate, triallyl melamine, N,N'-methylene-bisacrylamide, glycerine trimethacrylate, diallyl maleate, divinyl ether, diallyl mono ethylene glycol citrate, ethylene glycol vinyl allyl citrate, allyl vinyl maleate, diallyl itaconate, ethylene glycol diester of itaconic acid, divinyl sulfone, hexahydro-1,3,5-triacryltriazine, triallyl phosphite, diallyl ester of benzene phosphonic acid, polyester of maleic anhydride with triethylene glycol, polyallyl sucrose, polyallyl glucose, e.g. diallyl sucrose and triallyl glucose, sucrose diacrylate, glucose dimethacrylate, pentaerythritol diacrylate, sorbitol dimethacrylate.

The cross-linked polymers are characterized by being insoluble in the solvents. Typical examples of suitable cross-linked hydrophilic polymers are those in Wichterle Pat. 2,976,576, Wichterle Pat. 3,220,960, e.g. Examples III, V, VI, VII, and IX, Wichterle Pat. 3,361,858, Examples 1, 2, 3, 6, 8, 9, 10, and 11, as well as copolymers of 30 parts ethylene glycol with 0.1 part ethylene glycol bis-methacrylate; 54.7 parts ethylene glycol monomethacrylate, 17.2 parts diethylene glycol monomethacrylate and 0.6 part of diethylene glycol dimethacrylate; 80 parts ethylene glycol monomethacrylate, 15 parts methacrylamide and 0.4 part of ethylene glycol bis-methacrylate; 97 parts ethylene glycol monomethacrylate, 0.25 part diethylene glycol dimethacrylate and 0.25 part ethylene glycol bis-methacrylate; 60 parts ethylene glycol monomethacrylate, 19.7 parts diethylene glycol monomethacrylate, 0.3 part ethylene glycol bis-methacrylate, 99.6 parts ethylene glycol monomethacrylate and 0.4 part ethylene glycol bis-methacrylate, 99.5 parts ethylene glycol monomethacrylate and 0.4 part ethylene glycol bis-methacrylate, 99.7 parts ethylene glycol monomethacrylate and ethylene glycol bis-methacrylate; 98.7 parts ethylene glycol monomethacrylate and 0.3 part diethylene glycol dimethacrylate. They can also be prepared using the procedures set forth in our parent application 654,044 or the procedures employed in the specific examples below.

Unless otherwise indicated all parts and percentages are by weight.

The hydrophilic polymers of this invention possess unique properties which are capable of improving a wide range of cosmetic products. In particular, they impart to such products a wide range of unusual and desirable properties and effects on the skin and hair, such as lubricity, emolliency, softening and smoothing, resistance to and

protection against the drying effects of alcohol solutions, resistance to water and/or soap or detergents and water, freedom from tactile greasiness or oiliness due to mineral and/or vegetable oils, marked solvency and coupling effects for lanolin, lanolin isolates and derivatives either alone or in the presence of mineral and vegetable oils and freedom from tackiness or greasiness in preparations containing any of the above-mentioned materials.

Considering specific applications of the hydrophilic polymers; they are useful in creams, which essentially comprise an oleaginous base, either as an addition thereto or to replace, at least in part, oily fatty and/or waxy ingredients of the creams. For example, the polymers may partly replace the almond oil, mineral oil, lanolin, beeswax, paraffin wax, oleic acid, or spermaceti, and the like, which are conventionally used in creams, whether of the cleansing, emollient, or finishing types, and including cold cream, quick-liquefying cream, liquid cleanser cream, night cream, massage cream, vanishing cream, foundation cream, and various special creams. An advantage of replacing at least part of such materials is that the soiling tendency of the creams is reduced, that is to say, the creams after being spread over the skin by the user are less apt to pick up or attract soil or foreign particles, similarly, the deposited creams transfer off the user's skin less readily, as by contact with clothing, bed sheets, and the like. This last advantage is of particular importance in other creams such as deodorants, including deodorizer and anti-perspirant creams, which are used under the arms and on the palms and soles and which are quite apt to come in contact with clothing and to soil it to such an extent that the garments are frequently ruined. The lanolin, petrolatum, cresin, beeswax, cocoa butter, and/or stearic acid contents of emollient and vanishing creams, and also of cream and paste rouges, can be partly supplanted to reduce their soiling tendency, and more particularly to reduce their oily or greasy feel while yet retaining their power of free motion over the skin. Because they are lubricitous in a cream preparation without increasing its oleaginous character, cross-linked polymers are suitable for addition to creams to be applied to the oily skin.

Special creams such as protective creams can usefully incorporate the polymers of this invention. The creams can be of any suitable type, such as a mixture of fats and oils, a jelly containing a physical barrier, an emulsion, or a soap base. These creams are of particular value for protecting the hands from injury, or from soiling, in carrying out many processes and procedures in industrial plants. These creams containing physical barriers are particularly adapted to receive the hydrophilic polymers, which being available in various particle sizes, may form protective barriers on the skin of varying degrees of fineness and smoothness.

Make-up powders for the face may benefit from the presence of the polymers. These powders usually comprise an opacifying agent (clay, titania, magnesia zinc oxide, etc.), a slip material (talc, metal stearates, etc.), an adherent material (stearates, clay, etc.) and an absorbent (chalk, calcium carbonate, kaolin, etc.). The hydrophilic polymers are capable of replacing in whole or in part, metal salts and oxides like chalk, kaolin, magnesium carbonate, talc, titania, magnesium stearate, zinc oxide, zinc stearate and the like. An advantage of such a substitution is the reduced incidence of undesirable dermatological reactions. For example, in the case of magnesium carbonate, a widely used ingredient, it is known that some persons are sensitive to the presence of trace amounts of elements like selenium, arsenic, or mercury which tend to be present in the magnesium carbonate owing to the difficulty of purifying it. The gravity of the problem is underlined by the fact that amounts of selenium as low as one part per million may be detrimental. Other conventional ingredients, if not sufficiently fine, may give rise to mechanical irritation. In the case

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of ingredients like talc, by omitting it there is eliminated its characteristic earthy odor, which otherwise must be masked. Of further interest is the effectiveness of the polymers for sorbing oil, this properly being useful in face powders for combating oily skin, especially on the nose. By sorption is meant the capacity of the polymeric powder to absorb oily, fatty, greasy, waxy and aqueous materials.

In addition to the foregoing capabilities, the polymers are of benefit to loose face powder compositions by virtue of their excellent adherence to surfaces including the skin, by the degree to which their particle size may be varied, and by the extent to which their fluffiness or bulk density may be changed. Therefore, they are useful in place of the adherent agents noted. By incorporating conventional amounts of a desired color and a desired perfume, a complete, esthetically suitable face powder may be made which will inherently have a mat effect, and which may be used per se or serve as a base, with or without the color and perfume, to which only minor additions need be made to obtain desired finished powders to suit different types of skin.

In compact powders, including face powder and rouge, which are pressed after the addition of a binder like gum arabic, gum tragacanth, glycerin, sorbitol, etc., the use of the hydrophilic polymers can eliminate the need for the binder as they are inherently compressible in the dry or wet state to any desired degree.

The polymers are also useful in lipstick compositions and can replace one or more oleaginous ingredients in whole or part, such as the fats and waxes, with the advantage or decreased greasiness without loss of lubricity, and improved consistency retention. Fats and waxes which are commonly used in lipstick compositions include beeswax, carnauba wax, ceresin, lanolin, lard, mineral oil, petrolatum, etc. Conventionally used lipstick flavors, usually comprising a volatile, water-immiscible organic ester, may be better retained in the lipstick owing to the good sorptive capacity of the polymers for such compounds. The polymers form free-flowing, apparently dry mixes with flavors, and thus can facilitate lipstick manufacture by serving as a carrier for introducing these volatile compounds to the production batch and losses of the flavors may be reduced.

In mascara preparations such as mascara cake, the polymers can supplant conventional soaps like triethanolamine stearate, triethanolamine, oleate, etc., and thereby render the preparation less irritating to the eyes. The waxes frequently used in these preparations, and also in roll-on mascara and cream mascara, can be at least partly replaced with advantages similar to those described in wax substitutions. The hydrophilic polymers of this invention are also capable of imparting a cleaner effect to eyelashes, avoiding the thick, pasty, or crumbly look resulting from the use of some conventional preparations or the startling effect imparted by some enamel-like preparations. Use of the polymers permits a wider selection of colors to be employed and thus may avoid dependence on the conventional but somewhat dangerous use of silver nitrate with sodium thiosulfate. Suitable colors include natural pigments, e.g. carbon, ochers, siennas, umbers, ultramarine, etc. In similar ways, the polymers are of value to other cosmetics for use around the eye, as in eye shadow sticks, eye liner pencils, and eyebrow pencils.

The hydrophilic polymers of the invention can improve shaving creams, soaps and sticks of the lathering type by strengthening and stabilizing the lather.

In sunscreen products, including suntan products and leg paints, the hydrophilic polymers provide lubricity without greasiness, and in addition, the adherence of the product to the skin is enhanced, and its water-removability improved. As these preparations are frequently in dispersion form, a further advantage resides in the stability which is imparted to the dispersions by the presence of the polymers. Of interest in this connection are simple

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2-, 3-, or 4-component sunscreen preparations made by mixing a base like petrolatum or zinc oxide or lanolin with the hydrophilic polymer and water. A sunburn preventive can be added to help block out harmful radiation, including such agents as acetanilide, chloesterol, p-aminobenzoic and salicylic acid salts, quinine salts, and the like. These components form compatible mixtures. Suntan make-up, whether in loose powder form for the face and other areas, or in cake form, can be benefited in the manner described for make-up powders.

In manicure compositions, water removable nail coating compositions can be prepared comprising simply a hydrophilic polymer of this invention, a coloring agent, and solvent. The polymers provides the necessary adherence to the nails. Such compositions are of value for application to the nails for a single occasion of short duration, after which the coatings are removable by simply washing the hands in water.

The polymers of this invention are also effective in hair preparations.

The present invention overcomes the disadvantages pointed out supra of previous hair preparations. Even though the hydrophylic polymers of the invention are insoluble in water, they are easily removed, e.g. with conventional shampoo.

Hair sprays produced according to this invention comprise a soluble hydrophylic polymer such as previously described and a non-toxic organic solvent. When an aerosol is to be prepared then a propellant is also used. As the organic solvent there can be employed alcohols, particularly lower aliphatic saturated alcohols e.g. ethyl alcohol, isopropyl alcohol, propyl alcohol, glycols, e.g. ethylene glycol diethylene glycol, propylene glycol and dipropylene glycol, glycerine, ethylene glycol methyl ether, ethylene glycol ethyl ether, n-propylene glycol monomethyl ether, n-propylene glycol monoethyl ether, isopropylene glycol monomethyl ether, isopropylene glycol monoethyl ether, ethyl acetate. Mixtures of these solvents with minor amounts of water, e.g. up to 30% water, can be also employed. Glycols and glycerine and similar polyhydric alcohols act as plasticizers for the hydrophylic polymer.

Generally the amount of hydrophylic polymer will be about 0.5 to 10%, preferably 0.75 to 5%, by weight of the total hair spray composition.

Hair setting and hair straightening compositions are also produced according to the invention using 0.5 to 10% of the hydrophylic polymer in the solvent.

Such compositions not only provide the desired temporary set-holding characteristics and maintains the hair in the desired configuration until removed, but do so even when the hair is exposed to conditions of high humidity without the development of any appreciable surface track. In addition, the hair thus treated, despite its resistance to moisture, is remarkably free from any tendency to develop static electrical charges when combed or brushed under conditions of low humidity. Furthermore, the treated hair is capable of being reset merely by use of water-dampened comb. Finally, the film on the hair may readily be removed, despite its resistance to moisture, by a mild shampoo.

The hydrophylic polymers can be used not only in solution, but also in compositions having the form of stable gels, creams and the like without requiring the presence of an emulsifying agent. They can have the physical form of a jelly, paste, plastic mass, or the like and generally comprise the hydrophylic polymer in an amount of 2 to 15% by weight of the total composition. Advantageously there can be included 7 to 20% of a thixotropic agent such as Carbopol 961 (sucrose acrylate having free acid groups).

The amount of solvent is usually 10% or more of the total hair preparation. When a propellant is present the solvent is normally not over 60% and is preferably 25 to 40% of the total hair preparation by weight.

When the hydrophylic polymer is packaged in an aerosol container the propellant should be sufficient to force the composition out of the container as a spray. The propellant can vary considerably, but usually is about 25 to 85%, preferably 50 to 70%, of the total hair spray composition. As the aerosol propellants there can be used compressed gasses such as carbon dioxide, nitrous oxide and nitrogen, liquified volatile hydrocarbons such as propane, n-butane, isobutane, 2-methyl butane and fluorinated compounds including perhalogenated compounds and fluorinated hydrocarbons such as dichlorodifluoromethane, trichlorofluoromethane, 1,2-dichlorotetrafluoroethane, octafluorocyclobutane, chlorodifluoromethane, 1,1-difluoroethane, 1-chloro-1,1-difluoroethane. These fluorinated compounds are available under the names Freon and Genetron. The propellant should contain a substantial amount of volatile material boiling at not over 20° C., but there can also be present a significant amount of less volatile material boiling up to 50° C., e.g. methylene chloride can be present as a substantial part of the propellant. Of course perfumes or other essences can be included in the formulations.

As catalysts for carrying out the polymerization there is employed free radical catalyst in the range of 0.05 to 1% of the polymerizable hydroxyalkyl ester, for example, the preferred amount of catalyst is 0.1 to 0.2% of the monomer. Typical catalysts include t-butyl peroctoate, benzoyl peroxide, isopropyl percarbonate, methylethylketone peroxide, cumene hydroperoxide and dicumylperoxide. Irradiation, e.g., by ultra violet light or gamma rays, also can be employed to catalyze the polymerization. Polymerization can be done at 20 to 150° C., usually 40 to 90° C.

When cross-linked polymers are prepared the method of polymerization is not critical and the monomers can be polymerized in water, by suspension polymerization, in organic solvent or without any solvent. However, when hydrophylic soluble thermoplastic polymers are desired they are preferably prepared by suspension polymerization of the hydrophylic monomers in a non-polar medium such as silicone oil, mineral oil, xylene, toluene, benzene or the like. Alternatively they can be polymerized while in solution in ethyl alcohol, methyl alcohol, propyl alcohol, isopropyl alcohol, formamide, dimethyl sulfoxide or other appropriate solvent.

In the suspension polymerization procedure the catalyst containing monomer is dispersed in the non-polar medium in the form of small droplets which are polymerized to form finely divided spheres or beads. The beads are dissolved in the polar organic solvents, e.g., ethyl alcohol, isopropyl alcohol, ethyl alcohol-water (e.g. 95:5 or 70:30), glycols and glycol ethers for use as sprays, etc. or are mixed with other ingredients to make creams, powders or the like.

Suspension polymerization is preferably carried out at 50–150° C. until bead formation is completed. The ratio of suspension oil to monomer can be varied widely, but preferably is from 5:1 to 20:1. As stated the catalyst to monomer ratio is preferably from 0.05 to 1.0 part per 100 parts of monomer.

One method of incorporating the hydrophylic polymeric powders with cosmetic ingredients or essences dissolved in an appropriate solvent is to place the mixture on a mechanical roller so that the solution becomes intimately mixed with the powder. The mixture is dried by air evaporation or forced heat. Upon evaporation of the solvent the cosmetic ingredients and/or essences are retained by the powder.

EXAMPLE 1

Into a flask equipped with an agitator and a heating mantle was charged 1000 grams of silicone oil; polydimethyl silicone, 100 grams of 2-hydroxyethyl methacrylate and 0.33 gram of isopropyl percarbonate. The flask was placed under a nitrogen atmosphere and the

contents were rapidly agitated and heated to 100° C. After 15 minutes at 100° C., the polymer slurry obtained was filtered hot to isolate the polymer. The polymer powder was reslurried in 300 ml. of xylene, filtered and dried. A 98% yield of 2 to 5 micron particle size powder was obtained.

EXAMPLE 2

The thermoplastic, solvent soluble poly-(2-hydroxyethyl methacrylate) polymeric powder formed in Example 1 was mixed with an oil of orchids perfume essence and the resultant mixture placed on a mechanical roller for approximately 8 hours. The polymeric powder thus absorbed the essence. The mixture was filtered and the residue dried at room temperature.

EXAMPLE 3

Example 1 was repeated using xylene in place of the silicone oil. The amount of 2-hydroxyethyl methacrylate was increased from 100 grams to 300 grams and the quantity of isopropyl percarbonate was increased to 0.99 gram. An 85% yield of polymer beads was obtained.

EXAMPLE 4

Example 1 was repeated using mineral oil in place of the silicone oil, the amount of 2-hydroxyethyl methacrylate was increased from 100 grams to 200 grams and the quantity of isopropyl percarbonate was increased from 0.33 to 0.66 gram. A 98% yield of polymer beads ranging in diameter from 2 to 5 microns was obtained.

EXAMPLE 5

800 grams of ethylene glycol monomethyl ether, 180 grams of 2-hydroxyethyl methacrylate, 20 grams of acrylic acid and 2 grams of t-butyl peroctoate were charged into a flask. The solution was heated and stirred under a carbon dioxide atmosphere at 85° C. for 6 hours. The thermoplastic hydrophylic polymer formed was precipitated by pouring the reaction solution into 10 liters of rapidly agitated water. The precipitated polymer was isolated by filtration and dried. The product of this example while thermoplastic and solvent soluble has the capability of curing to cross-linked solvent insoluble polymer by further heating, particularly if additional catalyst is added. In contrast, the polymers of Examples 1, 3, and 4 are permanently thermoplastic and solvent soluble. The copolymers formed in Examples 7–13 are all cross-linked.

EXAMPLE 6

The procedure of Example 1 was repeated replacing the 2-hydroxyethyl methacrylate by 100 grams of 2-hydroxypropyl methacrylate to produce a thermoplastic solvent soluble hydrophylic finely divided bead polymer.

EXAMPLE 7

This example shows the preparation of a cross-linked polymer prepared with the aid of a foaming agent. The use of a foaming agent, e.g. sodium bicarbonate, potassium bicarbonate, azodicarbonamide, benzene sulfonyl hydrazide, azo-bis-isobutyronitrile, etc. aids in preparing polymers which are in the form of a foam which is easily disintegrated to form a fine powder by means of a shearing action. Quantities of 0.5 to 10 grams of foaming agent per 100 grams of reactants are adequate.

100 grams of 2-hydroxyethyl methacrylate, 0.15 gram of t-butyl peroctoate, 0.20 gram of ethylene glycol dimethacrylate and 1 gram of sodium bicarbonate were heated to 70° C. and the resulting solid friable polymeric foam ground into a powder of 80 mesh size (U.S. standard sieve).

EXAMPLE 8

100 grams of purified 2-hydroxyethyl methacrylate was mixed with 0.2 gram of ethylene glycol dimethacrylate and 1 gram of benzoyl peroxide. The mixture was sprayed via a nozzle which forms fine droplets into a chamber

containing nitrogen at 150° C. After spraying of the monomer was concluded, 36 grams of polymer beads were recovered.

EXAMPLE 9

An aqueous solution was prepared from 15% acrylamide, 10% ethylene glycol monomethacrylate, 0.1% ethylene glycol dimethacrylate and the balance water. One liter of this solution was mixed with 10 ml. of an aqueous 2% solution of sodium thiosulfate and 15 ml. of an aqueous 2% solution of ammonium persulfate and the mixture allowed to polymerize at room temperature. The resulting gel was then finely divided to give a cross-linked hydrophylic polymer.

EXAMPLE 10

A polymerization mixture was prepared from 15 parts methacrylamide, 80 parts ethylene glycol monomethacrylate, 0.4 part ethylene glycol bis-methacrylate and 5 parts of dibenzoyl peroxide. The mixture was rotated at 400 r.p.m. in a helium atmosphere at 80° C. for 6 hours to give a cross-linked copolymer. The polymer was then finely divided (below 100 mesh).

EXAMPLE 11

97 parts of ethylene glycol monomethacrylate, 0.25 part ethylene glycol bis-methacrylate, 0.25 part diethylene glycol bis-methacrylate, 2 parts ethylene glycol and 0.2 part diisopropyl percarbonate were rotated 80 minutes at 420 r.p.m. in a carbon dioxide atmosphere at 60° C. to produce a cross-linked hydrophylic copolymer. The polymer was then finely divided, i.e. to less than 100 mesh.

EXAMPLE 12

15 parts of a monomer mixture consisting of 99.7% ethylene glycol monomethacrylate and 0.3% ethylene glycol bis-methacrylate as a cross-linking agent, 85 parts glycerol and 0.1 part diethyl percarbonate as a catalyst was heated at 65° C. for 20 minutes to form a cross-linked hydrophylic polymer.

EXAMPLE 13

50 ml. of a mixture of 98% ethylene glycol monomethacrylate, 0.3% diethylene glycol bis-methacrylate and 1% ethylene glycol were mixed with 50 ml. formamide and an amount of azo-bis-isobutyronitrile corresponding to 0.2% of the combined monomers. Polymerization was performed at 75° C. for 50 minutes to give a cross-linked hydrophylic polymer.

EXAMPLE 14

30 grams of the solvent soluble, thermoplastic hydrophylic poly(2-hydroxyethyl methacrylate) prepared in Example 1 was dissolved in 70 ml. of methanol. To the solution was added 4.0 grams of peppermint oil. The viscous solution was coated on an impervious plate and allowed to dry to form a film 1.0 mil thick. The dry film was stripped from the plate and ground to form minute platelets. These were incorporated in an amount of about 1% in crest-type toothpaste devoid of flavoring to provide prolonged release of the peppermint flavor on contact of the product with an aqueous medium, e.g. in the normal brushing of teeth.

The toothpaste formula was:

	Parts
Hydrophylic polymer platelets containing peppermint oil	1
Calcium pyrophosphate	39
Sodium carboxymethyl cellulose	1.20
Magnesium aluminum silicate	0.40
Sorbitol	20.00
Sodium coconut monoglyceride sulfonate	0.81
Sodium lauryl sulfate	0.70
Saccharin	0.12
Stannous pyrophosphate	1.00
Water	25.77

EXAMPLE 15

A hair setting composition was prepared from 1.90 parts of the poly 2-hydroxyethyl methacrylate prepared in Example 1, 0.10 part of perfume (oil of orchids) and 28 parts of ethyl alcohol. This solution (50% of the total formulation) was packaged in a conventional aerosol pressure can container together with 45.5 parts (32% of the total formulation) of monofluorotrichloromethane and 24.5 parts (18% of the total) of methylene chloride.

The aerosol was sprayed on hair held in a desired configuration and allowed to dry, the formulation was found to provide satisfactory set-holding characteristics even under conditions of high humidity. The sprayed hair was natural looking, non-sticky, non-static and exhibited holding power for a relatively long period of time.

EXAMPLE 16

A 5% solution of the polymeric 2-hydroxyethyl methacrylate prepared in Example 1 in 95% ethyl alcohol (95% alcohol, 5% water) was applied to kinky hair. The hair was relaxed and then rolled on rollers and held in tension until dried. When dry the hair was set and could be combed in conventional fashion. The permanent remained until the hair was wet.

Drying can be accomplished with or without a conventional hair dryer. In place of the rollers any other conventional means for holding the hair in tension can be employed.

EXAMPLE 17

A more flexible wave can be obtained by incorporating 5 to 100%, based on the polymer, of glycerol, sorbitol, diethylene glycol, dipropylene glycol, ethylene glycol, propylene glycol or other liquid polyhydric alcohol as a plasticizer.

Thus a more flexible wave than that of Example 16 was obtained by applying to the hair, a solution of 5 parts of the poly 2-hydroxyethyl methacrylate, 100 parts of 95% ethyl alcohol and 0.75 part of glycerol. After the hair was relaxed it was held in tension until dried using a hair dryer. The hair was thus set and was combed in conventional manner. Not only was a more flexible wave obtained, but the use of glycerol prevented flaking of the polymer when the hair was combed.

EXAMPLE 18

To impart greater sheen to the hair a small amount, e.g. 2-3%, of silicone oil can be added to the formulation. Thus the formulation of Example 17 was modified by adding 3% of dimethyl polysiloxane oil based on the 2-hydroxyethyl methacrylate polymer to give a flexible permanent wave having a high sheen.

The hair straightener compositions can be brushed on the hair, poured on the hair or combed on the hair. The preferred solvent is ethyl alcohol with or without minor amounts of water. There can also be employed other solvents such as isopropyl alcohol, monomethyl ether of ethylene glycol, monoethyl ether of ethylene glycol, normal or isopropylene glycol monomethyl ether, normal or isopropylene glycol monoethyl ether.

EXAMPLE 19

A hair setting gel was produced having the following formulation:

	Parts
Hydrophylic 2-hydroxyethyl methacrylate polymer of Example 1	10
95% ethyl alcohol	144
Water	36
Carbopol 940 (sucrose acrylate polymer having free acrylic acid groups)	1.2
Glycerine	1.4
Solulan 98 (acetylated polyoxyethylated lanolin)	1.0
Triton X-100 (polyoxyethylene (10)-nonylphenol condensate)	2.0
Essence (lavender oil)	0.6

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The polymer was dissolved in the alcohol-water mixture to form a solution. The solution was then mixed with the remaining ingredients by rapid stirring and the pH of the mixture adjusted to a pH of about 7.2 by adding a 10% solution of diisopropanolamine in 95% ethyl alcohol. This gel was suitable for setting hair. Thus a sample of curly hair was straightened by heat and pressure, coated with the above gel and soaked in water. A control sample of the curly hair was also straightened, but remained uncoated when soaked in water. The control sample returned to its original curly configuration after 30 seconds while the coated sample remained straight for about 3 minutes.

In place of the diisopropanolamine there can also be used triethanolamine, diethanolamine or tripropanolamine as a gelling agent in this example.

EXAMPLE 20

Into a bottle equipped with an agitator and a heating mantle was charged 20 liters of 2-hydroxy ethyl methacrylate, 50 liters of methanol, 30 liters of water and 10 grams of t-butyl peroxoate. The kettle was flushed with carbon dioxide and the contents were rapidly agitated and heated to 75° C. After 8 hours at 75° C. the polymer, representing an 85% polymeric conversion, was isolated. The polymer solution was precipitated from 500 liters of water, filtered and dried at room temperature.

EXAMPLE 21

A cosmetic emulsion with the following formulation was prepared.

Two solutions were formulated:

Solution A

Polymer produced according to Example 20	Parts 30
95% ethanol	61.34
Water	75.02
Essence	0.5

Solution B

Mineral oil	30
Atlas polysorbate 80	2.96
Triton X-100	0.68

Solution A is added slowly to solution B with rapid stirring for 5 minutes. A stable emulsion results which could be applied to the hands or face. Polysorbate 80 is polyoxyethylene (20) sorbitan monooleate.

EXAMPLE 22

An insect repellent sun screen lotion was prepared with the following formulation:

Hydrophylic polymer of Example 1	Parts 1
95% ethanol	60
Water	38
2-ethyl-1,3-hexandiol	0.5
2-ethoxyethyl-p-methoxy cinnamate	0.5

EXAMPLE 23

100 parts of the hydrophylic polymer prepared in Example 1 containing 10 parts of essence (oil of orchids) was homogeneously mixed with 5 parts of hexachlorophene. 75 parts of the resulting mixture was mixed with a conventional toilet soap (Ivory) to provide a composite soap having a pleasant smell, antiseptic and increased lubricity characteristics.

EXAMPLE 24

The hydrophylic polymers of the present invention in powder form can be incorporated in a fat or oil or lanolin in an amount of 1 to 40% to release a fragrance on contact with water. Thus 1 part of perfume was absorbed in 10 parts of the cross-linked hydrophylic polymer prepared in Example 7 and this was incorporated with 100 parts of lanolin.

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EXAMPLE 25

A sun screen aerosol was made from 1 part of the poly 2-hydroxyethyl methacrylate prepared in Example 1, 30 parts of 95% ethyl alcohol, 0.5 part of 2-ethoxyethyl-p-methoxy cinnamate and 68.5 parts of dichlorotetrafluoroethane. The aerosol was sprayed from the container onto the body and acted as an effective sun screen.

EXAMPLE 26

1 part of hexachlorophene was absorbed on 10 parts of the finely divided cross-linked hydrophylic methacrylate polymer prepared in Example 11. There was blended in 20 parts of talc and the deodorant powder was packaged in an aerosol container together with 30 parts of chlorotrifluoromethane and 10 parts of methylene chloride.

The ratio of polymer to talc can range from 10 to 90 parts of polymer to 90 to 10 parts of talc or the talc can be omitted.

EXAMPLE 27

20 parts of aluminum chlorohydrol, in 100 parts of water, 10 parts of hydroxyethyl methacrylate containing 1 part of perfume (e.g. rose oil) and 0.04 part of isopropyl percarbonate were polymerized at 70° C. for two hours. The solid obtained was ground to a powder—less than 300 mesh and was useful as a deodorant by applying the same to the body.

EXAMPLE 28

A nail enamel was prepared by making a 10% solution of the polymer prepared in Example 1 in alcohol together with a small amount of red dye. The resulting solution was applied to fingernails and allowed to dry.

EXAMPLE 29

A cleansing cream was prepared from a mixture of 5 parts almond oil, 15 parts lanolin, 5 parts of the hydrophylic 2-hydroxyethyl methacrylate polymer prepared in Example 1, 30 parts paraffin wax, 5 parts borax and 35 parts distilled water.

EXAMPLE 30

Another cleansing cream was prepared from 25 parts almond oil, 10 parts beeswax, 15 parts lanolin, 8 parts spermaceti, 12 parts of the hydrophylic cross-linked polymer of Example 11 and 30 parts of rose water.

EXAMPLE 31

A cleansing cream was prepared from 7 parts beeswax, 30 parts mineral oil, 15 parts soybean oil, 10 parts spermaceti, 1 part borax, 8 parts of the hydrophylic polymer prepared in Example 6 and 29 parts of rose water.

EXAMPLE 32

A vanishing foundation cream was prepared from 8 parts glycerol, 1 part potassium hydroxide, 20 parts stearic acid, 0.5 part perfume, 7 parts of the hydrophylic polymer of Example 1 and 63.5 parts of water.

EXAMPLE 33

A vanishing cream was prepared from 0.5 part cetyl alcohol, 5 parts glycerol, 4 parts lanolin, 3 parts mineral oil, 20 parts stearic acid, 2 parts triethanolamine, 0.5 part oil of orchids, 3 parts of the hydrophylic polymer prepared in Example 5 and 62 parts of water.

EXAMPLE 34

A quick-liquefying hand cream was made from 12 parts cresin, 85 parts mineral oil and 3 parts of the hydrophylic polymer prepared in Example 4.

EXAMPLE 35

An emollient cream for softening the skin was prepared from 5 parts lanolin, 4 parts beeswax, 10 parts cocoa butter, 10 parts almond oil, 35 parts solid petrolatum, 5 parts spermaceti, 3 parts of the hydrophylic polymer

prepared in Example 1, 0.5 part of perfume, 0.2 part preservative and 27.3 parts water.

EXAMPLE 36

A face powder was made from 10 parts precipitated chalk, 75 parts talc, 5 parts of the hydrophylic polymer of Example 1, 5 parts zinc oxide and 5 parts zinc stearate.

EXAMPLE 37

A loose face powder was prepared from 3 parts kaolin, 70 parts talc, 1.5 parts magnesium stearate, 2 parts of D & C Red No. 2 (lake) 20% in talc, D & C Red No. 3 (lake) 10% talc, 1 part yellow iron oxide 20% in talc and 1 part rose oil absorbed in 4.5 parts of the hydrophylic polymer of Example 7.

EXAMPLE 38

A cake type face powder was prepared from 10 parts kaolin, 5 parts zinc stearate, 10 parts zinc oxide, 3 parts magnesium carbonate, 61 parts talc (French), 1.4 parts of the hydrophylic polymer prepared in Example 1, 2 parts light mineral oil, 1 part cetyl alcohol, 0.3 part lanolin, 2.7 parts D & C Orange No. 4 (lake), 10% in talc, 0.8 part D & C No. 2 (lake), 20% in talc, 1 part brown iron oxide, 20% in talc and 0.8 part perfume.

EXAMPLE 39

A baby powder was prepared from 80 parts talc, 9 parts zinc stearate, 5 parts boric acid and 0.25 part perfume absorbed in 5.75 parts of the hydrophylic polymer prepared in Example 1.

EXAMPLE 40

A lipstick was prepared from 12 parts beeswax, 3 parts of the hydrophylic polymer of Example 1, 5 parts carnauba wax, 20 parts ceresin, 5 parts lanolin, 28 parts lard, 15 parts mineral oil, 2 parts of dibromo fluorescein and 10 parts of lakes (a mixture of equal parts of D & C No. 9 and D & C Orange No. 4).

What is claimed is:

1. In a process of improving the external appearance of the human body by applying to the body a cosmetic preparation the improvement comprising applying a cosmetic composition in powder form including a polymer powder of an acrylate or methacrylate selected from the group consisting of hydrophilic polymer of hydroxy lower alkyl acrylates, hydroxy lower alkyl methacrylates, hydroxy lower alkoxy lower alkyl acrylates and hydroxy lower alkoxy lower alkyl methacrylates.

2. A process according to claim 1 wherein the cosmetic

composition includes a deodorant and the deodorant is applied to the skin.

3. A process according to claim 2 wherein the composition is applied as a dry powder.

4. A process according to claim 3 wherein the composition is applied in the form of an aerosol spray.

5. A process according to claim 4 wherein the polymer is a 2-hydroxymethyl methacrylate powder.

6. A process according to claim 1 wherein the cosmetic composition is a dry powder and the powder is applied to the skin in the form of an aerosol spray and the acrylate powder or methacrylate is a member of the group consisting of hydroxyethyl acrylate, hydroxyethyl methacrylate, hydroxypropyl acrylate and hydroxypropyl methacrylate.

7. A process according to claim 1 wherein said polymeric powder is cross-linked and solvent insoluble.

8. A process according to claim 7 wherein the acrylate or methacrylate powder comprises a cross-linked and solvent insoluble polymer of a member of the group consisting of hydroxyethyl acrylate, hydroxyethyl methacrylate, hydroxypropyl acrylate and hydroxypropyl methacrylate.

9. A process according to claim 1 wherein said polymeric powder is solvent soluble.

10. A process according to claim 9 wherein the solvent soluble acrylate or methacrylate comprises a polymer of a member of the group consisting of hydroxyethyl acrylate, hydroxymethyl methacrylate and hydroxypropyl methacrylate.

11. A process according to claim 9 wherein the polymer is a polymer of 2-hydroxyethyl methacrylate.

12. A process according to claim 1 wherein the cosmetic preparation is a cosmetic powder and the powder is applied to the skin.

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