

SOFT POLYURETHANE FOAM USING HYDROCARBON POLYOL, AND COSMETIC COMPRISING SAME

TECHNICAL FIELD

5 The present application claims priority to Korean Patent Application No. 10-2015-0051752 filed on April 13, 2015 and Korean Patent Application No. 10-2015-0159751 filed on November 13, 2015, the disclosures of which are incorporated herein by reference.

 The present disclosure relates to a polyurethane foam and a cosmetic product
10 containing the same, more particularly to a soft polyurethane foam wherein the polarity of the polyurethane foam can be controlled easily and a cosmetic product containing the same.

BACKGROUND ART

 In general, a polyurethane foam is obtained by reacting a resin premix which is
15 prepared from a polyol, a catalyst for preparation of a polyurethane foam, a foaming agent, etc. with a polyisocyanate.

 The polyurethane foam is widely used as an insulating material in electric
refrigerators, freezers, cold storage warehouses, construction panels, etc. due to its superior
insulating performance, moldability and self-adhesivity and in automobile interior parts such
20 as seat cushions, seat backs, head rests, arm rests, instrument panels, door trims, ceiling
materials, etc., saddles of motorcycles, seats for airplanes and trains and cushioning materials
of furniture, bedding, chairs, etc. due to superior cushioning property.

 In general, a petroleum-based synthetic polyol is mainly used for the preparation of a
urethane foam. There have been many efforts to prepare ecofriendly polyurethanes by

replacing the petroleum-based polyol with a vegetable oil-based natural polyol (Petrovic, Z. S., "Polyurethanes from Vegetable Oils," *Polym. Rev.*, 48(1), 109-155 (2008); Kong, X., and Narine, S. S., "Physical Properties of Polyurethane Plastic Sheets Produced from Polyols from Canola Oil," *Biomacromolecules*, 8(7), 2203-2209 (2007); etc.). However, the urethane foams prepared from vegetable oils are mostly hard urethane foams and preparation of soft urethane foams using vegetable oils have not been studied enough. Although synthesis of soft foams only from a soybean oil-based polyol was reported, a lot of closed cells were observed (J. John, M. Bhattacharya, and R. B. Turner, Characterization of polyurethane foams from soybean oil, *J. Appl. Polym. Sci.*, 86, 3097 (2002).)

The soft polyurethane foam is utilized in various industrial applications such as packaging due to superior elasticity and mechanical strength (elongation, tensile strength and wear resistance) owing to its open cell structure.

Recently, as cosmetic products in which a cosmetic composition is impregnated in a urethane foam, such as cushion pacts, cushion cosmetics, are appraised as revolutionary products, interests in the soft urethane foam are increasing in the cosmetic product industry.

The urethane foam which is prepared from a polyol, a multifunctional isocyanate, a foaming agent, etc. may have various properties depending on the polyol. A soft urethane foam sponge is prepared from a polyol with a relatively large molecular weight. Polyether- and polyester-based polyols are mainly used.

As a urethane foam for impregnating a cosmetic composition, the ether-type polyurethane foam is usually used. However, the ether-type polyurethane foam is disadvantageous in terms of tensile strength, hardness, elongation and flame retardancy as compared to the ester-type polyurethane using a polyol containing ester linkages. The ester-type polyurethane foam has a uniform cell structure and is resistant against oxidation

due to superior chemical resistance. However, it is known to have weak water resistance because it is hydrolyzed unlike the ether-type polyurethane foam. For this reason, its use for impregnating a cosmetic composition is extremely limited.

5 There have been efforts to select a suitable urethane foam impregnating material by mixing an ether-based polyol with an ester-based polyol according to the physical properties and ingredients of a cosmetic composition. However, there is a problems in that the polyols do not have good compatibility.

Although polarity can be controlled to some extent by controlling the compositional ratio of the isocyanate and other additives used in the preparation of the polyurethane foam,
10 there is a limitation in controlling the polarity variously according to the physical properties of the cosmetic composition.

DISCLOSURE

Technical Problem

15 The present disclosure is designed to solve the problems and is directed to providing a soft urethane foam which has improved durability and can be used without deformation.

The present disclosure is also directed to providing a novel soft urethane foam that can be used variously in the cosmetic product industry.

The present disclosure is also directed to providing a novel impregnating material for
20 impregnating a cosmetic composition and a cosmetic product containing the same.

The present disclosure is also directed to providing an impregnating material for impregnating a cosmetic composition, which is advantageous for impregnation of a lipophilic cosmetic composition, and a cosmetic product containing the same.

The present disclosure is also directed to providing a method for controlling the

polarity of an impregnating material according to the kind of a cosmetic composition and an impregnating material for impregnating a cosmetic composition prepared by using the same.

Technical Solution

5 In order to solve the problems described above, the inventors of the present disclosure provide a composition for preparing a soft urethane foam by using a hydrocarbon polyol. In general, a vegetable oil-based polyol used for preparing a foam has a molecular weight of 1000 g/mol or smaller, which is so small to be prepared into a soft foam and is also disadvantageous in that many closed cells are generated because cell opening is difficult due
10 to increased crosslinking density. In order to solve this problem, the inventors of the present disclosure have researched for a long time to prepare a urethane foam using a polyol including a vegetable oil and to prepare a soft urethane foam in which an open cell structure is formed easily and have completed the present disclosure.

In an exemplary embodiment, the present disclosure provides a soft urethane foam
15 composition using a vegetable oil or a dimer acid derived from a vegetable oil and a soft urethane foam using the composition. Specifically, in another exemplary embodiment, the present disclosure provides a soft urethane foam composition for a cosmetic product, using a vegetable oil or a dimer acid derived from a vegetable oil, and a soft urethane foam using the composition. Specifically, the present disclosure provides a soft urethane foam composition
20 containing one or more selected from a group consisting of a hydrocarbon polyol, a vegetable oil or a dimer acid derived from a vegetable oil. Specifically, the present disclosure provides an impregnating material for impregnating a cosmetic composition, prepared using the composition for preparing a urethane foam, and a cosmetic product containing the impregnating material.

The inventors of the present disclosure have completed the present disclosure after consistent efforts to develop a soft urethane foam having the advantages of both an ester-type urethane foam and an ether-type urethane foam. In particular, the inventors of the present disclosure have found out that impregnation efficiency can be affected by the physical
5 properties of a cosmetic composition impregnated in an impregnating material and have made efforts to develop a urethane foam impregnating material capable of overcoming the difficulty of mixing an ether polyol and an ester polyol due to poor compatibility of the polyols.

The inventors of the present disclosure have developed a soft urethane foam using a
10 novel type of polyol that has never been attempted in the cosmetic product industry.

Although there have been attempts to prepare a foam by including a vegetable oil in a composition for preparing a urethane foam as a polyol, it could be hardly used to prepare a soft urethane foam due to high crosslinking density and generation of a lot of closed cells. However, a urethane foam prepared according to the present disclosure has an open cell
15 structure and, thus, is advantageous in preparing a soft urethane foam.

Specifically, the soft urethane foam is used in industrial and household cleaning appliances, furniture such as sofa and bed, automobile parts, oil absorbents, sound-absorbing materials, etc. In particular, in the cosmetic product industry, it is used for application puffs, packaging and packing materials, facewashing appliances, etc. Particularly, it may be
20 specifically used as an impregnating material for impregnating a cosmetic composition.

In the cosmetic product industry, there is a limitation in selecting a polyol for preparing a urethane foam for impregnating a cosmetic composition because a cosmetic product containing both aqueous and oil components should be impregnated, the impregnating material should be pressed constantly using an applicator, a predetermined

shape should be maintained despite compression or pressure from outside and the impregnating material should be able to resist wearing or disintegration. However, the inventors of the present disclosure have developed a polyol for preparing a urethane foam for impregnating a cosmetic composition that can satisfy all the conditions.

5 The present disclosure provides a soft urethane foam composition for preparing a soft urethane foam, containing a polyol, wherein the polyol is any one selected from i) a hydrocarbon polyol, ii) any one selected from a vegetable oil and a dimer acid derived from a vegetable oil and iii) a mixture of a hydrocarbon polyol with any one selected from a vegetable oil and a dimer acid derived from a vegetable oil. Specifically, the polyol may
10 contain a hydrocarbon polyol and a vegetable oil together.

 In an exemplary embodiment of the present disclosure, the polyol containing a hydrocarbon polyol and a vegetable oil together may contain the vegetable oil in an amount of less than 50 wt%, specifically less than 45 wt%, and more specifically less than 42 wt%, based on the total weight of the polyol contained in the composition.

15 When the polyol contains the hydrocarbon polyol and the vegetable oil together, if the content of the vegetable oil exceeds 50 wt%, compatibility between the polyols is not good and a soft urethane foam is not formed stably.

 In an exemplary embodiment of the present disclosure, the hydrocarbon polyol, the vegetable oil or the dimer acid derived from a vegetable oil may have a carbon-carbon double
20 bond and all or part of the double bond may be modified by an addition reaction.

 The modified double bond may be a double bond present in a side chain rather than in a main chain.

 As used herein, the term 'modification' refers to induction of crosslinking or graft polymerization by adding an addition reaction initiator or a monomer such as a vinyl

monomer, an acryl monomer, an acryl ester monomer, etc. to a carbon-carbon double bond.

In the present disclosure, the term 'main chain' is used as the same meaning as generally recognized in the art. In the present disclosure, it refers to bonds forming the backbone of a hydrocarbon polyol, a vegetable oil, a dimer acid derived from a vegetable oil,
5 etc. and means a carbon-rich hydrocarbon chain.

As used herein, the term 'side chain' refers to bonds branching from a main chain.

The hydrocarbon polyol may have 2-10 hydroxy functional groups and a number-average molecular weight of 100-100,000 g/mol, specifically 300-50,000 g/mol, more specifically 500-10,000 g/mol. When the molecular weight of the hydrocarbon polyol
10 is smaller than 100 g/mol, elasticity may be lost. And, when it exceeds 100,000 g/mol, it may be difficult to prepare a desired foam due to high viscosity at room temperature.

Specifically, the hydrocarbon polyol contained in the composition for preparing a soft urethane foam of the present disclosure may be any polybutadiene polyol selected from a group consisting of cis-1,4-polybutadiene polyol, trans-1,4-polybutadiene polyol,
15 1,2-polybutadiene polyol and a mixture thereof. Most specifically, a cis-1,4-polybutadiene polyol/trans-1,4-polybutadiene polyol/1,2-polybutadiene polyol mixture may be used.

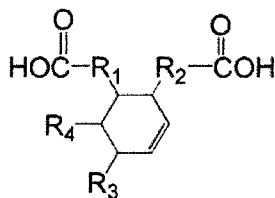
The vegetable oil may include castor oil, soybean oil, sunflower oil, safflower seed oil, olive oil, rapeseed oil, etc. If necessary, modified rapeseed oil having hydroxyl groups introduced, modified sunflower oil having hydroxyl groups introduced, etc. may be used.
20 Specifically, the vegetable oil may be castor oil. The castor oil is rich in the main ingredient linoleic acid and can be modified variously due to the presence of triglycerides, double bonds and many hydroxyl groups like other vegetable oils. Specifically, it may be advantageous in preparing the soft urethane foam of the present disclosure because it does not require introduction of hydroxyl groups for use as a polyol and has a large molecular weight, unlike

other vegetable oils.

The dimer acid derived from a vegetable oil may be derived from waste cooking oil, safflower seed oil, tall oil, fish oil, rapeseed oil, olive oil, etc. For example, dimer acids having 36 or more carbon atoms, trimer acids having 54 or more carbon atoms or
5 non-conjugated dimer acids obtained from thermal polymerization of dienes in a vegetable oil may be used.

These compounds are generally known substances. For example, a dimer acid derived from a vegetable oil, represented by Chemical Formula 1, may be used in the present disclosure.

10 [Chemical Formula 1]



wherein each of R₁ and R₂ represents a C₄-C₈ linear alkylene group and each of R₃ and R₄ represents a C₄-C₈ linear alkyl group.

In another exemplary embodiment of the present disclosure, the hydrocarbon polyol,
15 the vegetable oil or the dimer acid derived from a vegetable oil of the present disclosure may have a carbon-carbon double bond and all or part of the double bond may be modified by an addition reaction.

The modification may be performed through crosslinking between polymers or through graft polymerization by adding any one selected from a group consisting of a vinyl
20 monomer, an acryl monomer and an acryl ester monomer.

For example, crosslinkages between the double bonds of the polybutadiene polyol may be formed by the addition reaction initiator, as can be seen from FIG. 1.

As another example, the double bonds of the polybutadiene polyol may be grafted by adding acrylic acid as an acryl monomer, as can be seen from FIG. 2.

The above description given with reference to FIG. 1 and FIG. 2 only illustrates exemplary embodiments of the present disclosure and the present disclosure is not limited to
5 FIG. 1 and FIG. 2.

Specifically, the foam prepared using the composition for preparing a foam, containing the hydrocarbon polyol and the vegetable oil (or the dimer acid derived from a vegetable oil) together may allow easy control of the polarity of a cosmetic composition when the cosmetic composition is impregnated in the foam.

10 The addition reaction initiator is not particularly limited and various examples such as a radical reaction initiator such as a peroxide, a peroxyester, an azo compound, etc., a cationic initiator such as boron trifluoride, etc. may be used.

For example, any initiator selected from a group consisting of benzoyl peroxide, t-butyl peroxybenzoate, t-amyl peroxy-2-ethylhexanoate, t-butyl peroxy-pivalate, t-amyl
15 peroxy-pivalate, di-(2-ethylhexyl) peroxydicarbonate, di-n-propyl peroxydicarbonate, di-sec-butyl peroxydicarbonate, 3-hydroxy-1,1-dimethylbutyl peroxyneodecanoate, 3-hydroxy-1,1-dimethylbutyl peroxyneohexanoate, t-amyl peroxyneodecanoate, 2,5-dimethyl-2,5-di-(2-ethylhexanoylperoxy)hexane, diisononanoyl peroxide, dodecanoyl peroxide, dioctanoyl peroxide, t-butyl peroxyneodecanoate, t-butyl perbenzoate,
20 1,1-dimethyl-3-hydroxybutyl peroxy-2-ethylhexanoate, benzoyl peroxide, 1,1,3,3-tetramethylbutyl peroxy-pivalate, di-(3,5,5-trimethylhexanoyl) peroxide, 1,1,3,3-tetramethylbutyl peroxy-2-ethylhexanoate, azobisisobutyronitrile, 2,2'-azobis-(2-methoxybutyronitrile) and a mixture thereof may be used.

In addition, a protonic acid, a Lewis acid or an easily ionizable compound may be

used. As specific examples, H_2SO_4 , HClO_4 , HCl , BF_3 , BCl_3 , $\text{BF}_3\cdot\text{O}(\text{C}_2\text{H}_5)_2$, TiCl_4 , AlCl_3 , AlBr_3 , SnCl_4 , etc. may be used. Also, various onium salts such as ammonium salts, phosphonium salts, sulfonium salts, etc., methyltriphenylphosphonium bromide, ethyltriphenylphosphonium bromide, phenyltriphenylphosphonium bromide, etc. may be
5 used without limitation. These initiators may also be added in various combinations and also may be used together with the various radical initiators described above.

In another exemplary embodiment of the present disclosure, one or more selected from a group consisting of a vinyl monomer, an acryl monomer and an acryl ester monomer may be added to the double bond of the vegetable oil or the dimer acid derived from a
10 vegetable oil.

For example, any one selected from a group consisting of: a carboxyl group-containing vinyl monomer selected from a group consisting of acrylic acid, methacrylic acid, carboxyethyl acrylate, carboxypentyl acrylate, itaconic acid, maleic acid, fumaric acid and crotonic acid; an acid anhydride vinyl monomer selected from a group
15 consisting of maleic anhydride and itaconic anhydride; a hydroxyl group-containing vinyl monomer selected from a group consisting of hydroxyethyl acrylate, hydroxyethyl methacrylate, hydroxypropyl acrylate, hydroxypropyl methacrylate, hydroxybutyl acrylate, hydroxybutyl methacrylate, hydroxyhexyl acrylate and hydroxyhexyl methacrylate; an N-substituted amide-based vinyl monomer selected from a group consisting of
20 N,N-dimethylacrylamide and N,N-dimethylmethacrylamide; an alkoxyalkyl acrylate vinyl monomer selected from a group consisting of methoxyethyl acrylate, methoxyethyl methacrylate, ethoxyethyl acrylate and ethoxyethyl methacrylate; a vinyl monomer selected from a group consisting of vinyl acetate, vinyl propionate, N-vinylpyrrolidone, methylvinylpyrrolidone, vinylpyridine, vinylpiperidone, vinylpyrimidine, vinylpiperazine,

vinylpyrazine, vinylpyrrole, vinylimidazole, vinyloxazole, vinylmorpholine, N-vinylcarbonamide, styrene, α -methylstyrene and N-vinylcaprolactam; a cyanoacrylate vinyl monomer selected from a group consisting of acrylonitrile and methacrylonitrile; an epoxy group-containing acryl monomer selected from a group consisting of glycidyl acrylate and glycidyl methacrylate; a glycol-based acryl ester monomer selected from a group consisting of polyethylene glycol acrylate, polyethylene glycol methacrylate, polypropylene glycol acrylate, polypropylene glycol methacrylate, methoxyethylene glycol acrylate, methoxypolyethylene glycol methacrylate, methoxypolypropylene glycol acrylate and methoxypolypropylene glycol methacrylate; or a mixture thereof may be used.

The composition for preparing a foam of the present disclosure may further contain, in addition to the any one selected from a group consisting of a hydrocarbon polyol, a vegetable oil or a dimer acid derived from a vegetable oil, a foaming agent, a surfactant, a catalyst and an isocyanate compound necessary for preparing a polyurethane foam.

As the foaming agent, a chemical foaming agent such as water, a hydroxyfluorocarbon (HFC-245fa, etc.), a hydrocarbon (cyclopentane, etc.) or a physical foaming agent such as carbon dioxide, liquefied carbon dioxide, dichloromethane, etc. may be used. Among them, water, carbon dioxide, liquefied carbon dioxide are advantageous when considering the purpose of the present disclosure. Most specifically, water may be used as the foaming agent according to the present disclosure, although a physical foaming agent such as liquefied carbon dioxide, etc. may also be used. When water is used as the foaming agent, it may be contained in an amount of specifically 1.3-6.5 parts by weight, more specifically 1.5-6.0 parts by weight, more specifically 1.8-5.5 parts by weight, most specifically 2.0-5.0 parts by weight, based on 100 parts by weight of the total polyol component. When the amount of water as the foaming agent is within the above-described

range, foaming is achieved stably and effectively.

As the surfactant, a previously known surfactant may be used. Specifically, a commonly used organosilicon-based surfactant may be used, although not being particularly limited thereto. For example, Dow Corning Toray Silicone Co. Ltd.'s FV-1013-16, SRX-274C, SF-2969, SF-2961, SF-2962, L-3601, SZ-1325 and SZ-1328, Momentive's
5 L-5309, L-5307, L-3600, L-5366, L-580 and Y-10366, Air Products' DC-2525 and DC-6070, Evonik's B-8715, B-8742 and B-8450, or the like may be used specifically. The surfactant may be contained in an amount of specifically 0.1-10 parts by weight, more specifically 0.5-5 parts by weight, based on 100 parts by weight of the total polyol component.

10 As the catalyst, any catalyst used in the art to prepare a polyurethane foam may be used. For example, an aliphatic amine such as triethylenediamine, bis(2-dimethylaminoethyl)ether, 1-isobutyl-2-methylimidazole, morpholino, etc., an organotin compound such as stannous octoate, dibutyltin dilaurate, etc., or the like may be used specifically. These catalyst may be used either alone or in combination.

15 The polyol mixture is mixed with the isocyanate compound to prepare the urethane foam of the present disclosure. The isocyanate compound may be one or more selected from a group consisting of tolylene diisocyanate (TDI), diphenylmethane diisocyanate (MDI), naphthalene diisocyanate (NDI), xylylene diisocyanate (XDI), isophorone diisocyanate (IPDI), hexamethylene diisocyanate (HMDI) and a derivative thereof.

20 The composition for preparing polyurethane of the present disclosure may further contain other ingredients generally used in the art. Examples may include a cell stabilizer, a crosslinking agent, a chain extender, a flame retardant, a filler, an auxiliary urethane gelling catalyst, a transition metal catalyst, etc. Any specific examples of these ingredients known in the art may be contained in the composition.

In an exemplary embodiment of the present disclosure, the soft urethane foam may be prepared by the following method.

A method for preparing a urethane foam commonly employed in the art may be used without being limited to the following description. The following preparation method is
5 given only as an example of the method for preparing a polyurethane foam of the present disclosure.

The preparation method may include: (S1) a step of mixing a hydrocarbon polyol, a vegetable oil or a dimer acid derived from a vegetable oil with an additive such as water as a chemical foaming agent, a physical foaming agent, a silicone surfactant, an amine or an
10 organometal compound as a reaction catalyst, a radical-generating compound, a vinyl monomer or an acryl monomer as an initiator for crosslinking or grafting of polybutadiene; (S2) a step of mixing the resulting polyol mixture with an isocyanate compound generating polyurethane by reacting with the mixture; and (S3) a step of subjecting the mixture resulting from the step (S2) to foaming at room temperature to 100 °C or higher, gelling and then
15 curing.

In an exemplary embodiment, the present disclosure provides a cosmetic product: including a polyurethane foam for impregnating a cosmetic composition, which contains one or more selected from a group consisting of a hydrocarbon polyol, a vegetable oil or a dimer acid derived from a vegetable oil, and a cosmetic composition impregnated in the
20 polyurethane foam.

The present disclosure provides a use of a polyurethane foam prepared using one or more polyol selected from a group consisting of a hydrocarbon polyol, a vegetable oil or a dimer acid derived from a vegetable oil as an impregnating material for impregnating a cosmetic composition.

In the present disclosure, the impregnating material may be used to impregnate a liquid composition, specifically a cosmetic composition.

In the present disclosure, the term impregnation is used as a meaning generally used in the cosmetic product industry. Specifically, it refers to storage of a content in a material
5 having pores formed therein such as a sponge.

The storage means the ability of holding and storing any substance (for example, including not only a liquid or gel-type cosmetic composition but also a high-viscosity cosmetic composition).

For example, the substance may be a liquid substance having fluidity such as a
10 perfume, a liquid detergent (for dishwashing or laundry), although not being specially limited thereto.

Also, a cosmetic composition having fluidity may be stored inside the impregnating material and may be used as a cosmetic product allowing the cosmetic composition to be applied onto the skin using a separate tool, although not being necessarily limited thereto.

15 The cosmetic composition having fluidity may include a skin toner, a lotion, a cream, a gel, a liquid foundation, a gel-type foundation, etc., although not being necessarily limited thereto.

In the cosmetic product including the impregnating material of the present disclosure, a lipophilic cosmetic composition having an outer oil phase may be impregnated in a
20 polyurethane foam using a hydrocarbon polyol modified by forming crosslinkages between the double bonds of the hydrocarbon polyol using an addition reaction initiator.

In the present disclosure, the term "outer phase" may refer to the part of a cosmetic composition which is mainly in contact with an impregnating material when it is impregnated in the impregnating material. For example, for a cosmetic composition consisting of a

single phase (i.e., a single water phase or a single oil phase), the single phase is an outer phase. The outer phase of a water-in-oil emulsion is an oil phase and the outer phase of an oil-in-water is a water phase. For a multiple emulsion '(X)/(X)_n/Y' (wherein 'X' and 'Y' may be a water phase ('W') or an oil phase ('O') and 'n' is 1 or greater), the 'Y' is an outer phase.
5 For example, in an oil-in-water-in-oil emulsion (O₁/W/O₂), the outer phase may be an 'oil phase (O₂)'.

The cosmetic product may be obtained by impregnating a cosmetic composition in a soft polyurethane foam formed by foaming a hydrocarbon polyol modified by forming partial crosslinkages between the double bonds of the hydrocarbon polyol using an addition reaction
10 initiator. The viscosity of the cosmetic composition is not particularly limited as long as it can be impregnated. For example, the cosmetic composition may have a viscosity of 1,000-10,000 cPs.

In another exemplary embodiment, the cosmetic product may be obtained by impregnating a cosmetic composition in a soft polyurethane foam formed by foaming a
15 hydrocarbon polyol modified by adding one or more monomer selected from a group consisting of a vinyl monomer and an acryl monomer to the double bonds of the hydrocarbon polyol. The viscosity of the cosmetic composition is not particularly limited as long as it can be impregnated. For example, the cosmetic composition may have a viscosity of 1,000-10,000 cPs.

20

Advantageous Effects

The present disclosure provides a composition for preparing a urethane foam, which is useful in preparing a soft urethane foam.

The present disclosure can be advantageously applied to a cosmetic puff, applicator,

etc. used in the cosmetic product industry due to strong corrosion resistance.

The present disclosure allows utilization of the superior characteristics of both the ester-based urethane foam and the ether-based urethane foam. The present disclosure alleviates the problem that the control of physical and chemical properties is limited due to poor compatibility between the polyols used for preparing the ester- and ether-based foams.

Because the soft urethane foam of the present disclosure has a superior oil-adsorbing ability, it may be used as an oil adsorbent when marine oil spill occurs.

The present disclosure provides an impregnating material for impregnating a cosmetic composition, which is advantageous in impregnating a lipophilic cosmetic composition.

The present disclosure provides a method for preparing an impregnating material for impregnating a cosmetic composition, wherein the polarity of the impregnating material can be controlled for impregnation of a hydrophilic cosmetic composition.

The present disclosure can solve the swelling problem of an impregnating material which may occur when a cosmetic composition is impregnated.

The present disclosure improves the durability of an impregnating material and allows use of the impregnating material without deformation or corrosion.

DESCRIPTION OF DRAWINGS

FIG. 1 shows a reaction scheme wherein the double bonds of polybutadiene segments of polybutadiene polyol as a representative hydrocarbon polyol are crosslinked by a radical initiator.

FIG. 2 shows a reaction scheme wherein the double bonds of polybutadiene segments of polybutadiene polyol as a representative hydrocarbon polyol are grafted by

acrylic acid as one of acryl monomers in the presence of a radical initiator.

FIG. 3 shows a result of investigating corrosiveness after impregnating a cosmetic composition in a soft urethane foam (M3) of the present disclosure (left) and impregnating a cosmetic composition in an ester-type urethane foam (right).

5

BEST MODE

Hereinafter, preferred embodiments of the present disclosure will be described in detail with reference to the accompanying drawings. Prior to the description, it should be understood that the terms used in the specification and the appended claims should not be construed as limited to general and dictionary meanings, but interpreted based on the meanings and concepts corresponding to technical aspects of the present disclosure on the basis of the principle that the inventor is allowed to define terms appropriately for the best explanation. Therefore, the description proposed herein is just a preferable example for the purpose of illustrations only, not intended to limit the scope of the disclosure, so it should be understood that other equivalents and modifications can be made thereto without departing from the scope of the disclosure.

[Preparation of soft polyurethane foam]

Example 1. Modification of polyol

20 A hydrocarbon polyol can be modified by performing grafting of a vinyl monomer or an acryl monomer before preparation of a foam or by performing crosslinking or grafting during the preparation of a foam.

(1) Grafting of vinyl monomer or acryl monomer before preparation of foam

Polybutadiene polyol with a number-average molecular weight of 2,800 g/mol was modified by adding methacrylic acid to the polybutadiene polyol using benzoyl peroxide as an addition reaction initiator. Based on the total weight of the polyol, the content of the initiator was 0.2% and the addition amount of the methacrylic acid was 2%. The
5 modification was performed at 80 °C for 6 hours.

(2) Crosslinking or grafting during preparation of foam

A polybutadiene polyol-based polyurethane foam was modified during foaming of the polyurethane foam by adding methacrylic acid to polybutadiene polyol with a
10 number-average molecular weight of 2,800 g/mol using t-butyl perbenzoate as an addition reaction initiator. Based on the total weight of the polyol, the content of the initiator was 0.2% and the addition amount of the methacrylic acid was 2%.

Example 2. Foaming of polyurethane foam using polybutadiene-based hydrocarbon
15 polyol and castor oil

A soft polyurethane foam can be prepared using polybutadiene-based hydrocarbon polyol (0.2/0.6/0.2 (w/w) mixture of cis-1,4-polybutadiene polyol/trans-1,4-polybutadiene polyol/1,2-polybutadiene polyol) having a molecular weight 2,800 g/mol and having 2.5 functional groups and castor oil as follows. First, the polyol and castor oil are mixed as
20 described in Table 1 at room temperature and then prepared into a sufficiently uniform state by stirring. Vacuum degassing and drying are conducted to remove gases included during the stirring of the mixture and water that may affect the reaction of polyurethane. A catalyst, a surfactant and a foaming agent are added to the obtained polyol mixture as described in the following table and then stirred at high speed for about 10 seconds. Then, after adding a

weighed isocyanate compound (toluene diisocyanate (TDI T-80/T-65/T-100) and stirring at high speed for 10 seconds, the mixture is injected into a mold. During foaming, the time when the rise in height due to foaming stops (rise time: RT) and the time when fluidity is lost and strength is increased due to gelation (gelation time: GT) are checked to investigate the progress of the reaction. The obtained foam is kept at room temperature for 24 hours and then cut to suit the desired purpose. If necessary, the foam may be reticulated through an additional process.

The mixing ratios and characteristics of the foam are described in Table 1. The content is given in wt% unit.

[Table 1]

Sample code	M1	M2	M3	M4	M5
Polybutadiene polyol (MW 2,800 g/mol, 2.5 functional groups)	100	90	80	70	60
Castor oil	0	10	20	30	40
Water	2	2	2	2	2
Amine catalyst (triethylenediamine)	0.6	0.6	0.6	0.6	0.6
Organometal catalyst (stannous octoate)	1.0	1.0	1.0	1.0	1.0
Silicone surfactant (L590 from Air Products)	1.5	1.5	1.5	1.5	1.5
Isocyanate index*	100	100	100	100	100
RT (sec)	100	98	98	98	98
GT (sec)	125	122	118	115	110

State	Good	Good	Good	Good	Good
Density (kg/m ³)	40	41	42	43	44
Hardness (Asker F)	50	60	70	80	90

*Isocyanate equivalents/polyol equivalents (also called NCO index)

A soft urethane foam was prepared according to the method described above except that, while mixing the polyol with castor oil, t-butyl perbenzoate as a peroxide initiator and acrylic acid as an acryl monomer were added as described in Table 2 and then prepared into a sufficiently uniform state by stirring. Through the modification process, a butadiene polyol/castor oil/hydrogenated castor oil (70/25/5) mixture was obtained as a urethane foam composition.

[Table 2]

Sample code	M31	M32	M33	M34	M35
Polybutadiene polyol (MW 2,800 g/mol, 2.5 functional groups)	80	80	80	80	80
Castor oil	20	20	20	20	20
Water	2	2	2	2	2
Amine catalyst (triethylenediamine)	0.6	0.6	0.6	0.6	0.6
Organometal catalyst (stannous octoate)	1.0	1.0	1.0	1.0	1.0
Silicone surfactant (L590)	1.5	1.5	1.5	1.5	1.5
Peroxide initiator (t-butyl	0.2	0.2	0.2	0.2	0.2

perbenzoate)					
Acryl monomer (acrylic acid)	0	0.5	1.0	1.5	2.0
Isocyanate index	100	100	100	100	100
RT (sec)	98	98	98	98	98
GT (sec)	118	119	118	118	119
State	Good	Good	Good	Good	Good
Density (kg/m ³)	42	41	42	43	44
Hardness (Asker F)	72	73	74	75	76

[Preparation of cosmetic composition]

A foundation described in Table 3 was prepared as follows.

After adding oil phase ingredients and a thickener in an oil phase tank and
5 homogenizing the mixture by heating to 80 °C, pigments were added and dispersed. In a
water phase tank, water phase ingredients were added and completely melted by heating to 80
°C. The resulting mixture was added to the oil phase tank in which the pigments were
dispersed. Then, a low-viscosity sunblock emulsion was prepared by emulsifying with a
homomixer. After filling the emulsion in a 40-mL container and keeping in a chamber at 25
10 °C for at least one day, viscosity was measured at 25 °C with a Brookfield LVII viscometer
using spindle No. 4 after operation at 30 rpm for 1 minute.

[Table 3]

	Ingredients (wt%)	Composition 1	Composition 2
Oil phase ingredients	Cyclopentasiloxane	25.0	25.0
	Ethylhexyl methoxycinnamate	7.5	7.5

	Ethylhexyl salicylate	3.0	3.0
	Ethylhexanol	5.0	5.0
	Dimethicone	3.0	3.0
	Caprylic/capric triglyceride	3.0	3.0
	PEG-10 dimethicone	3.0	3.0
	Sorbitan sesquioleate	1.0	1.0
	Disteardimonium hectorite	0.1	0.5
Pigments	Titanium dioxide	5.0	5.0
	Mica	3.0	3.0
	Yellow iron oxide	1.0	1.0
	Red iron oxide	0.2	0.2
	Black iron oxide	0.1	0.1
Water phase ingredients	Purified water	To 100	To 100
	Dipropylene glycol	5.0	5.0
	Salt	1.0	1.0
Viscosity		2,000-3,000 cps	3,000-5,000 cps

[Soft urethane foam impregnating material]

Test Example 1. Effect of impregnation of cosmetic product

The surface appearance of the soft urethane foams prepared according to Tables 1 and 2 was not different significantly from the commonly used sponge and were found to be useful to be used as an impregnating material for a cosmetic composition.

The following experiments were conducted to investigate the soft urethane foams

suitable to be used as an impregnating material for impregnating a cosmetic composition.

► Stability of cosmetic composition

After impregnating the cosmetic compositions 1 and 2 with the viscosity controlled
5 using an inorganic thickener into a sponge, the separation of the cosmetic composition in the
sponge was observed (for 3 weeks after keeping in a constant-temperature oven at 50 °C).

When the cosmetic compositions 1 and 2 were not impregnated into the sponge,
separation of the oil ingredients occurred for both the compositions 1 and 2.

[Table 4]

Sample code	Ether-type urethane foam	M2	M3	M4	M5
Stability of cosmetic composition	Separation occurred in compositions 1	No abnormality	No abnormality	No abnormality	No abnormality
Sample code		M32	M33	M34	M35
Stability of cosmetic composition		No abnormality	No abnormality	No abnormality	No abnormality

10 As seen from Table 4, the soft urethane foam of the present disclosure showed
superior stability without separation of the cosmetic composition whereas the separation of
the cosmetic composition occurred in the ether-type urethane foam.

► Swelling phenomenon

After impregnating the cosmetic compositions 1 and 2 in the soft urethane foam, it was investigated whether swelling occurred 3 weeks later.

As can be seen from the following table, the swelling phenomenon was improved with the degree of crosslinking. The larger the sample code number, the greater the degree of crosslinking.

[Table 5]

Sample code	Ether-type urethane foam	M31	M33	M34	M35
Swelling	5%	8%	6%	5%	4%
Sample code		M2	M3	M4	M5
Swelling		10%	10%	10%	10%

► Disintegration or corrosion (hydrolysis resistance)

After impregnating the cosmetic composition sample 2 into a sponge, the change in external appearance was observed after keeping in a constant-temperature oven set to 50 °C for 3 weeks. The result is shown in Table 6.

[Table 6]

Sample code	Ether-type urethane foam (Korea Puff)	M2	M3	M4	M5
Hydrolysis	No abnormality	No	No	No	No

resistance (corrosion resistance)		abnormality	abnormality	abnormality	abnormality
Sample code	Ester-type urethane foam (Korea Puff/FoamTech)	M32	M33	M34	M35
Hydrolysis resistance (corrosion resistance)	Disintegration occurred	No abnormality	No abnormality	No abnormality	No abnormality

The ester-type urethane foam looked intact but was disintegrated when pressed with a finger. In contrast, the ether-type urethane foam and M2-M5 showed no abnormality. In particular, it was confirmed that the urethane foam was stable when the content of castor oil was less than 50 wt% based on the total weight of the polyol used to prepare the soft urethane foam due to good compatibility between the butadiene polyol and the vegetable oil. The urethane foams prepared according to the present disclosure showed no disintegration or collapse with time due to superior hydrolysis resistance.

In particular, they showed improvement in swelling phenomenon as compared to the ether-type urethane foam which is known to have superior corrosion resistance.

[Soft urethane foam puff]

A cosmetic applicator was prepared using the soft urethane foam prepared according to Tables 1 and 2. When applying a cosmetic composition to the skin using an applicator, a

foam providing a soft touch tends to have a corrosiveness problem and one with improved corrosiveness tends to feel rather rough. However, the applicator (puff) prepared from the soft urethane foam of the present disclosure could provide soft touch while having strong corrosion resistance.

5 In particular, the puff of the present disclosure did not show deformation or breaking even after washing.

[Cosmetic product packing material using soft urethane foam]

10 A packaging material for packing a cosmetic composition was prepared using the soft urethane foam prepared according to Tables 1 and 2. The soft urethane foam of the present disclosure was suitable for packaging and packing a cosmetic composition due to superior elasticity and strong corrosion resistance. In addition, when used as a material for increasing adhesion to the cap of a container of mascara, it showed excellent elasticity and shape retaining ability.

15

WHAT IS CLAIMED IS:

1. A soft urethane foam composition for preparing a soft urethane foam, comprising a polyol, wherein the polyol is any one selected from a hydrocarbon polyol, any
5 one selected from a vegetable oil and a dimer acid derived from a vegetable oil, or a mixture of a hydrocarbon polyol and any one selected from a vegetable oil and a dimer acid derived from a vegetable oil.

2. The soft urethane foam composition according to claim 1, wherein the
10 hydrocarbon polyol has 2-10 hydroxy functional groups and a number-average molecular weight of 100-100,000 g/mol.

3. The soft urethane foam composition according to claim 2, wherein the hydrocarbon polyol has 2-3 hydroxy functional groups and a number-average molecular
15 weight of 300-50,000 g/mol.

4. The soft urethane foam composition according to claim 1, wherein the polyol has a carbon-carbon double bond and all or part of the double bond is modified by an addition reaction.

20 5. The soft urethane foam composition according to claim 1, wherein the polyol comprises a hydrocarbon polyol and a vegetable oil together.

6. The soft urethane foam composition according to claim 5, wherein the polyol

comprises the vegetable oil in an amount of less than 50 wt% based on the total weight of the polyol.

7. The soft urethane foam composition according to claim 4, wherein the
5 addition reaction is performed through crosslinking between polymers by an addition reaction initiator or is performed by adding any one selected from a group consisting of a vinyl monomer, an acryl monomer and an acryl ester monomer.

8. The soft urethane foam composition according to claim 4, wherein the
10 modification is performed by introducing crosslinking by adding an addition reaction initiator.

9. The soft urethane foam composition according to claim 7, wherein the
addition reaction initiator is one or more selected from a group consisting of benzoyl
15 peroxide, t-butyl peroxybenzoate, t-amyl peroxy-2-ethylhexanoate, t-butyl peroxy-pivalate, t-amyl peroxy-pivalate, di-(2-ethylhexyl) peroxydicarbonate, di-n-propyl peroxydicarbonate, di-sec-butyl peroxydicarbonate, 3-hydroxy-1,1-dimethylbutyl peroxyneodecanoate, 3-hydroxy-1,1-dimethylbutyl peroxyneohexanoate, t-amyl peroxyneodecanoate, 2,5-dimethyl-2,5-di-(2-ethylhexanoylperoxy)hexane, diisononanoyl peroxide, dodecanoyl
20 peroxide, dioctanoyl peroxide, t-butyl peroxyneodecanoate, t-butyl perbenzoate, 1,1-dimethyl-3-hydroxybutyl peroxy-2-ethylhexanoate, benzoyl peroxide, 1,1,3,3-tetramethylbutyl peroxy-pivalate, di-(3,5,5-trimethylhexanoyl) peroxide, 1,1,3,3-tetramethylbutyl peroxy-2-ethylhexanoate, azobisisobutyronitrile, 2,2'-azobis-(2-methoxybutyronitrile), methyltriphenylphosphonium bromide,

ethyltriphenylphosphonium bromide, phenyltriphenylphosphonium bromide, H₂SO₄, HClO₄, HCl, BF₃, BCl₃, BF₃:O(C₂H₅)₂, TiCl₄, AlCl₃, AlBr₃ and SnCl₄.

10. The soft urethane foam composition according to claim 4, wherein the
5 modification is performed by adding one or more selected from a group consisting of a vinyl monomer, an acryl monomer and an acryl ester monomer using an addition reaction initiator.

11. The soft urethane foam composition according to claim 10, wherein the vinyl
monomer is one or more selected from a group consisting of: a carboxyl group-containing
10 vinyl monomer selected from a group consisting of acrylic acid, methacrylic acid, carboxyethyl acrylate, carboxypentyl acrylate, itaconic acid, maleic acid, fumaric acid and crotonic acid; an acid anhydride vinyl monomer selected from a group consisting of maleic anhydride and itaconic anhydride; a hydroxyl group-containing vinyl monomer selected from
a group consisting of hydroxyethyl acrylate, hydroxyethyl methacrylate, hydroxypropyl
15 acrylate, hydroxypropyl methacrylate, hydroxybutyl acrylate, hydroxybutyl methacrylate, hydroxyhexyl acrylate and hydroxyhexyl methacrylate; an N-substituted amide-based vinyl monomer selected from a group consisting of N,N-dimethylacrylamide and N,N-dimethylmethacrylamide; an alkoxyalkyl acrylate vinyl monomer selected from a group
consisting of methoxyethyl acrylate, methoxyethyl methacrylate, ethoxyethyl acrylate and
20 ethoxyethyl methacrylate; a vinyl monomer selected from a group consisting of vinyl acetate, vinyl propionate, N-vinylpyrrolidone, methylvinylpyrrolidone, vinylpyridine, vinylpiperidone, vinylpyrimidine, vinylpiperazine, vinylpyrazine, vinylpyrrole, vinylimidazole, vinyloxazole, vinylmorpholine, N-vinylcarbonamide, styrene, α -methylstyrene and N-vinylcaprolactam; and a cyanoacrylate vinyl monomer selected from a group consisting of acrylonitrile and

methacrylonitrile.

12. The soft urethane foam composition according to claim 10, wherein the acryl
monomer is one or more selected from a group consisting of glycidyl acrylate and glycidyl
5 methacrylate.

13. The soft urethane foam composition according to claim 10, wherein the acryl
ester monomer is one or more selected from a group consisting of polyethylene glycol
acrylate, polyethylene glycol methacrylate, polypropylene glycol acrylate, polypropylene
10 glycol methacrylate, methoxyethylene glycol acrylate, methoxypolyethylene glycol
methacrylate, methoxypolypropylene glycol acrylate and methoxypolypropylene glycol
methacrylate.

14. The soft urethane foam composition according to claim 1, wherein
15 composition for preparing a soft urethane foam for impregnating cosmetic compositions
further comprises an isocyanate compound, a foaming agent, a surfactant and a catalyst.

15. The soft urethane foam composition according to claim 14, wherein the
isocyanate compound is a one or more selected from a group consisting of tolylene
20 diisocyanate (TDI), diphenylmethane diisocyanate (MDI), naphthalene diisocyanate (NDI),
xylylene diisocyanate (XDI), isophorone diisocyanate (IPDI), hexamethylene diisocyanate
(HMDI) and a derivative thereof.

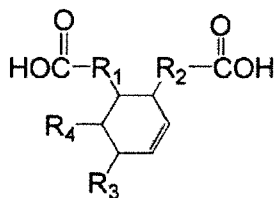
16. The soft urethane foam composition according to claim 1, wherein the

hydrocarbon polyol is a polybutadiene polyol selected from a group consisting of cis-1,4-polybutadiene polyol, trans-1,4-polybutadiene polyol, 1,2-polybutadiene polyol and a mixture thereof.

5 17. The soft urethane foam composition according to claim 1, wherein the vegetable oil is one or more selected from a group consisting of castor oil, soybean oil, sunflower oil, safflower seed oil, olive oil and rapeseed oil.

10 18. The soft urethane foam composition according to claim 1, wherein the dimer acid derived from a vegetable oil is a compound represented by Chemical Formula 1:

[Chemical Formula 1]



wherein each of R₁ and R₂ represents a C₄-C₈ linear alkylene group and each of R₃ and R₄ represents a C₄-C₈ linear alkyl group.

15

19. A soft polyurethane foam prepared by foaming the composition according to any of claims 1 to 18.

20 20. The soft urethane foam according to claim 19, wherein the soft urethane foam is used as a material for impregnating a liquid composition, a cosmetic applicator or a packing material.

21. The soft urethane foam according to claim 20, wherein the liquid composition comprises a cosmetic composition.

22. A cosmetic product having a cosmetic composition impregnated in a soft polyurethane foam, comprising:

the soft polyurethane foam according to claim 19; and

a cosmetic composition impregnated in the soft polyurethane foam.

23. The cosmetic product according to claim 22, wherein the cosmetic product comprises a cosmetic composition having a viscosity of 1,000-10,000 cps impregnated in a soft polyurethane foam formed by foaming a hydrocarbon polyol modified by forming crosslinkages between the double bonds of the hydrocarbon polyol using an addition reaction initiator.

24. The cosmetic product according to claim 22, wherein the cosmetic product comprises a cosmetic composition having a viscosity of 1,000-10,000 cps impregnated in a soft polyurethane foam formed by foaming a hydrocarbon polyol modified by adding one or more monomer selected from a group consisting of a vinyl monomer and an acryl monomer to the double bonds of the hydrocarbon polyol.