

Description

Title of the Invention:

ULTRAVIOLET-CURABLE RESIN COMPOSITION, CURED PRODUCT,
5 AND ARTICLE

Technical Field

[0001]

The present invention relates to an ultraviolet-curable resin composition useful
10 for an optical disk having an organic dye recording layer.

Background Art

[0002]

At present, as optical disk recording media in practical use, there exist CD-R
15 and CD-RW where a recording layer, a reflective layer and a protective layer composed of
an ultraviolet-curable resin are laminated on a polycarbonate substrate having a thickness
of 1.2 mm and DVD-R, DVD+R, DVD-RW, DVD+RW and DVD-RAM which are
constituted by attaching with an ultraviolet-curable resin a polycarbonate substrate having
a thickness of 0.6 mm and a polycarbonate substrate having a thickness of 0.6 mm which
20 has a recording layer and a reflective layer.

[0003]

In addition, recently, Blu-ray Disc (BD-R) of a single layer type having a
recording capacity about 5 times that of DVD is on the market. Blu-ray Disc is a disk
having a structure where a reflective layer, a recording layer and an interfacial layer are
25 formed on a transparent or opaque plastic substrate having a thickness of 1.1 mm and then
a light-transmitting layer having a thickness of about 0.1 mm is laminated on the interfacial
layer and is a disk where recording/reproducing is carried out via the light-transmitting
layer. An organic dye or an inorganic compound is used in the recording layer, a light-
transmitting inorganic substance is used in the interfacial layer, and a cured product layer
30 of an ultraviolet-curable resin is used as the light-transmitting layer.

[0004]

In Blu-ray Disc having a recording layer comprising an organic dye, the
recording layer is irradiated with a laser beam and recording is achieved utilizing
deformation by volume change of the organic dye. For the purpose of aiding the volume

change of the dye to obtain an excellent recording signal characteristic (e.g., jitter performance), there have been proposed a technology of forming a curable resin having an elastic modulus at 25°C of 40 MPa or less on the interfacial layer (Patent Document 1) and a technology of forming a curable resin having an elastic modulus at 25°C of 34 to 96 MPa or less (Patent Document 2).

[0005]

Moreover, as an evaluation index of reliability of the aforementioned optical disk recording media, there has been conducted an environmental test where a sample is left under an environment of a temperature of 80°C/a relative humidity of 80% RH for 100 hours. In order to control a degree of deterioration of the recording signal before and after the environmental test within a predetermined range, there has been proposed a technology of forming on the interfacial layer a curable resin having an elastic modulus of 100 MPa or less both at 5°C and 55°C and having a ratio of the elastic modulus at 5°C to the elastic modulus at 55°C of 10 or less (Patent Document 3).

[0006]

However, in Patent Documents 1 to 3, specific examples of the curable resins to be formed on the interface are not shown.

Background Art Documents

Patent Documents

[0007]

Patent Document 1: JP-A-2008-123631

Patent Document 2: JP-A-2008-269703

Patent Document 3: JP-A-2009-026379

Summary of the Invention

Problems that the Invention is to Solve

[0008]

An object of the present invention is to provide an ultraviolet-curable resin composition capable of imparting excellent recoding signal characteristic and durability in an optical disk having an organic dye recording layer.

Means for Solving the Problems

[0009]

As a result of extensive studies for solving the above problems, the present inventors have found that a ultraviolet-curable resin composition containing a (meth)acrylate having a specific structure can impart excellent recoding signal characteristic and durability to an optical disk having an organic dye recording layer and thus they have accomplished the present invention.

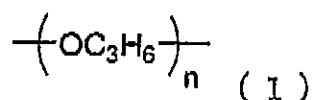
[0010]

Namely, the present invention relates to the following [1] to [11].

[1] An ultraviolet-curable resin composition for an optical disk having an organic dye recording layer, the composition comprising (A) a (meth)acrylate having a structure represented by the following general formula (1) and (B) a photopolymerization initiator:

[0011]

[Chem 1]



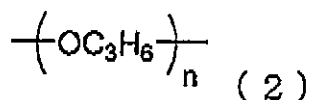
[0012]

wherein n represents an integer of 2 to 16.

[2] The ultraviolet-curable resin composition according to the above [1], wherein the (meth)acrylate (A) having a structure represented by the general formula (1) is the following formula (2):

[0013]

[Chem 2]



[0014]

wherein n represents an integer of 7 to 13.

[3] The ultraviolet-curable resin composition according to the above [1] or [2], wherein the (meth)acrylate (A) having a structure represented by the general formula (1) is at least one compound selected from the group consisting of polypropylene glycol

(meth)acrylate, polypropylene glycol di(meth)acrylate, polypropylene oxide-modified nonylphenyl (meth)acrylate, polypropylene oxide-modified neopentyl di(meth)acrylate, polypropylene oxide-modified 1,6-hexanediol di(meth)acrylate, polypropylene oxide-modified bisphenol A-type di(meth)acrylate, and methoxytripropylene glycol

5 (meth)acrylate.

[4] The ultraviolet-curable resin composition according to any one of the above [1] to [3], which contains (C) a (meth)acrylate other than (A).

10 [5] The ultraviolet-curable resin composition according to any one of the above [1] to [4], wherein the (meth)acrylate (A) having a structure represented by the general formula (1) is contained in an amount of 10 to 95% by weight based on the whole composition.

[6] The ultraviolet-curable resin composition according to any one of the above [1] to [5], wherein the (meth)acrylate (C) other than (A) is at least one compound selected from the group consisting of an epoxy (meth)acrylate, a reaction product of a polyester polyol or a polyether polyol, a polyisocyanate and a hydroxy (meth)acrylate, and ethylene oxide-modified bisphenol A-type diacrylate.

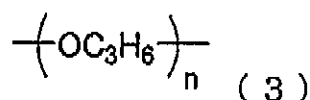
[7] A cured product obtained by irradiating the ultraviolet-curable resin composition according to any one of the above [1] to [6] with an active energy ray.

20 [8] An optical disk obtained by applying the ultraviolet-curable resin composition according to any one of the above [1] to [6] to an optical disk substrate and by irradiating the composition with an active energy ray.

[9] An ultraviolet-curable resin composition to be used as a forming material for the light-transmitting layer of Blu-ray Disc having a reflective layer, an organic dye recording layer, an interfacial layer and the light-transmitting layer on a substrate in this order, the composition comprising (A) a (meth)acrylate having a structure represented by the following general formula (3) and (B) a photopolymerization initiator:

[0015]

[Chem 3]



30

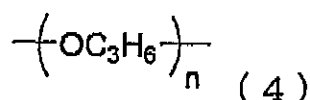
[0016]

wherein n represents an integer of 2 to 16.

[10] The ultraviolet-curable resin composition according to the above [9], wherein the (meth)acrylate (A) having a structure represented by the general formula (3) is the following formula (4):

[0017]

5 [Chem 4]



[0018]

wherein n represents an integer of 7 to 13.

10 [11] Blu-ray Disc having a reflective layer, an organic dye recording layer, an interfacial layer, and a light-transmitting layer on a substrate in this order, the light-transmitting layer comprising a cured product obtained by irradiating the ultraviolet-curable resin composition according to any one of claims 1 to 6 or claims 9 to 10 with an active energy ray.

15

Effect of the Invention

[0019]

In the case where the ultraviolet-curable resin composition containing a (meth)acrylate having a structure represented by the general formula (1) of the present invention is used as a light-transmitting layer of an optical disk having an organic dye recording layer, there can be provided an optical disk which is highly reliable at recording and in long-term use under high temperature and high humidity.

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Embodiment for Carrying Out the Invention

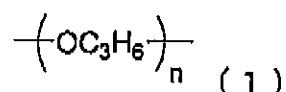
25 [0020]

The ultraviolet-curable resin composition for an optical disk having an organic dye recording layer (hereinafter simply referred to as "ultraviolet-curable resin composition") of the present invention contains a (meth)acrylate (A) having a structure represented by the following general formula (1) and a photopolymerization initiator (B).

30 In the present invention, a (meth)acrylate means a methacrylate or an acrylate and the kind is not particularly limited.

[0021]

[Chem 5]



5 [0022]

wherein n represents an integer of 2 to 16.

[0023]

As the (meth)acrylate (A) having a structure represented by the general formula (1) contained in the ultraviolet-curable resin composition of the present invention,
10 the (meth)acrylate can be used in the range where n is 2 to 16 without limitation. Moreover, the structure represented by the general formula (1) may be linear or branched but is desirably a branched structure derived from propylene glycol.

From the viewpoint of imparting excellent recording signal characteristic and durability, the (meth)acrylate having a structure represented by the general formula (1) is
15 preferably polypropylene glycol (meth)acrylate (for example, BLEMME AP-150: n=3 in the formula, AP-400: n=6 in the formula, AP-550: n=9 in the formula, AP-800: n=13 in the formula manufactured by NOF Corporation), polypropylene glycol di(meth)acrylate (for example, FANCRYL FA-P240A: n=7 in the formula, FA-P270A: n=12 in the formula manufactured by Hitachi Chemical Co., Ltd.), polypropylene oxide-modified nonylphenyl
20 (meth)acrylate (for example, M-117: n=2.5 in the formula manufactured by Toagosei Co., Ltd., NEW FRONTIER NP-5P: n=5 in the formula manufactured by Dai-ichi Kogyo Seiyaku Co., Ltd.) and methoxytripropylene glycol (meth)acrylate (for example, NK Ester AM-30PG: n=3 in the formula manufactured by Shin-Nakamura Chemical Co., Ltd.), polypropylene oxide-modified neopentyl di(meth)acrylate, polypropylene oxide-modified
25 1,6-hexanediol di(meth)acrylate, polypropylene oxide-modified bisphenol A-type di(meth)acrylate (for example, NEW FRONTIER BPP-6: n=6 in the formula manufactured by Dai-ichi Kogyo Seiyaku Co., Ltd.).

Here, from the viewpoint of imparting further excellent recording signal characteristic and durability, particularly preferred are those having a large value of n in
30 the general formula (1) according to the number of (meth)acryloyl groups in the molecule and suitable are those having n of 2 or more in the case where one (meth)acryloyl group is present in the molecule and those having n of 7 or more in the case where two (meth)acryloyl groups are present in the molecule. Specifically, there may be mentioned

polypropylene glycol (meth)acrylate (for example, BLEMME AP-150: $n=3$ in the formula, AP-400: $n=6$ in the formula, AP-550: $n=9$ in the formula manufactured by NOF Corporation), polypropylene glycol di(meth)acrylate (for example, FANCERYL FA-P240A: $n=7$ in the formula, FA-P270A: $n=12$ in the formula manufactured by Hitachi Chemical Co., Ltd.), polypropylene oxide-modified nonylphenyl (meth)acrylate (for example, M-117: $n=2.5$ in the formula manufactured by Toagosei Co., Ltd., NEW FRONTIER NP-5P: $n=5$ in the formula manufactured by Dai-ichi Kogyo Seiyaku Co., Ltd.) and methoxytripropylene glycol (meth)acrylate (for example, NK Ester AM-30PG: $n=3$ in the formula manufactured by Shin-Nakamura Chemical Co., Ltd.).

In this case, from the viewpoint of improving brittleness of the cured product, those having an n value of 7 to 13 are preferred and, in particular, those of $n=12$ are particularly preferred.

[0024]

The content of the (A) component in the ultraviolet-curable resin composition is usually 10 to 95% by weight, more preferably 20 to 80% by weight, and further preferably 20 to 80% by weight. When the content is less than 10% by weight, the volume change of dye cannot be aided and thus a jitter value (%) that is an index of the recording signal characteristic becomes worse. The jitter value (%) is particularly satisfactory 20% by weight or more and is preferably in the range of 20 to 95% by weight.

[0025]

The photopolymerization initiator (B) contained in the ultraviolet-curable resin composition of the present invention is not particularly limited. Examples thereof include 1-hydroxycyclohexyl phenyl ketone (Irgacure 184; manufactured by Ciba Specialty Chemicals), 2-hydroxy-2-methyl-[4-(1-methylvinyl)phenyl]propanol oligomer (ONE-Refined), 1-[4-(2-hydroxyethoxy)-phenyl]-2-hydroxy-2-methyl-1-propan-1-one (Irgacure-2959; manufactured by Ciba Specialty Chemicals), 2-hydroxy-1-{4-[4-(2-hydroxy-2-methyl-propionyl)-benzyl]-phenyl}-2-methyl-propan-1-one (Irgacure-127; manufactured by Ciba Specialty Chemicals), 2,2-dimethoxy-2-phenylacetophenone (Irgacure-651; manufactured by Ciba Specialty Chemicals), 2-hydroxy-2-methyl-1-phenyl-propan-1-one (Darocur 1173; manufactured by Ciba Specialty Chemicals), 2-methyl-1-[4-(methylthio)phenyl]-2-morpholinopropan-1-one (Irgacure-907; manufactured by Ciba Specialty Chemicals), 2-benzyl-2-dimethylamino-1-(4-morpholinophenyl)-butan-1-one, 2-chlorothioxanthone, 2,4-dimethylthioxanthone, 2,4-diisopropylthioxanthone, isopropylthioxanthone, 2,4,6-trimethylbenzoyldiphenylphosphine oxide, bis(2,4,6-

trimethylbenzoyl)-phenylphosphine oxide, bis(2,6-dimethoxybenzoyl)-2,4,4-trimethylpentylphosphine oxide, and the like.

[0026]

5 In the ultraviolet-curable resin composition of the present invention, one kind or two or more kinds of these (B) components can be used as a mixture at an optional ratio. The content of the component (B) in the ultraviolet-curable resin composition is usually 0.5 to 20% by weight and preferably 1 to 10% by weight.

[0027]

10 Furthermore, it is possible to use an amine, which can be a photopolymerization initiator auxiliary agent, in combination with the above photopolymerization initiator (B). Amines which can be used include benzoic acid 2-dimethylaminoethyl ester, dimethylaminoacetophenone, p-dimethylaminobenzoic acid ethyl ester, p-dimethylaminobenzoic acid isoamyl ester, and the like. When a photopolymerization initiator auxiliary agent such as the amine is used, its content in the
15 ultraviolet-curable resin composition of the present invention is usually 0.005 to 5% by weight and preferably 0.01 to 3% by weight.

[0028]

The ultraviolet-curable resin composition of the present invention may further contain a (meth)acrylate (C) other than (A) besides the above components.

20 As the (meth)acrylate (C) other than (A) contained in the ultraviolet-curable resin composition of the present invention, for example, there may be mentioned (meth)acrylates having at least one (meth)acryloyl group. The kind of the (meth)acrylate (C) other than (A) in the present invention is not particularly limited, and (C-1) an epoxy (meth)acrylate, (C-2) a urethane (meth)acrylate, (C-3) a (meth)acrylate monomer, and the
25 like can be used. Particularly, in the present invention, it is preferred to use (C-1) an epoxy (meth)acrylate and/or (C-2) a urethane (meth)acrylate and (C-3) a (meth)acrylate monomer singly or in combination.

[0029]

30 The epoxy (meth)acrylate (C-1) usable in the present invention has a function of improving curability and enhancing hardness of a cured product, mechanical strength (brittleness) and a curing rate. Moreover, in the present invention, as the epoxy (meth)acrylate, any of those obtained by reacting glycidyl ether-type epoxy compounds with (meth)acrylic acid can be used. The glycidyl ether-type epoxy compounds for obtaining epoxy (meth)acrylates preferably used in the present invention include diglycidyl

ether of bisphenol A or alkylene oxide adducts thereof, diglycidyl ether of bisphenol F or alkylene oxide adducts thereof, diglycidyl ether of hydrogenated bisphenol A or alkylene oxide adducts thereof, diglycidyl ether of hydrogenated bisphenol F or alkylene oxide adducts thereof, ethylene glycol diglycidyl ether, propylene glycol diglycidyl ether, neopentyl glycol diglycidyl ether, butanediol diglycidyl ether, hexanediol diglycidyl ether, cyclohexanedimethanol diglycidyl ether, polypropylene glycol diglycidyl ether, and the like.

[0030]

The epoxy (meth)acrylate can be obtained by reacting the glycidyl ether compound with (meth)acrylic acid under the conditions as described below.

[0031]

(Meth)acrylic acid is reacted in an ratio of 0.9 to 1.5 mol, more preferably 0.95 to 1.1 mol relative to 1 equivalent of the epoxy group of the glycidyl ether-type epoxy compound. The reaction temperature is preferably 80 to 120°C and the reaction time is approximately 10 to 35 hours. In order to accelerate the reaction, it is preferred to use a catalyst such as, for example, triphenylphosphine, 2,4,6-tris(dimethylaminomethyl)phenol (TAP), triethanolamine or tetraethylammonium chloride. In addition, it is also possible to use, for example, paramethoxyphenol, methylhydroquinone or the like as a polymerization inhibitor, in order to prevent polymerization during the reaction.

[0032]

In the present invention, the epoxy (meth)acrylate (C-1) is more preferably a bisphenol A-type epoxy (meth)acrylate obtained from a bisphenol A-type epoxy compound. In the present invention, the molecular weight of the epoxy (meth)acrylate (C-1) is preferably 500 to 10000.

[0033]

The urethane (meth)acrylate (C-2) usable in the present invention has a function of improving the mechanical properties (warping, distortion, etc.) of an optical disk laminated using the ultraviolet-curable resin composition of the present invention. The urethane (meth)acrylate is obtained by reacting a polyhydric alcohol, a polyisocyanate and a hydroxy (meth)acrylate compound.

[0034]

Examples of the polyhydric alcohol include neopentyl glycol, 3-methyl-1,5-pentanediol, (poly)ethylene glycol, (poly)propylene glycol, 1,4-butanediol, 1,6-hexanediol, trimethylolpropane, pentaerythritol, tricyclodecanedimethylol, bis-(hydroxymethyl)-

cyclohexane and the like, polyester polyols obtained by reacting these polyhydric alcohols with a polybasic acid (for example, succinic acid, phthalic acid, hexahydrophthalic anhydride, terephthalic acid, adipic acid, azelaic acid, tetrahydrophthalic anhydride, or the like), caprolactone alcohols obtained by reacting the polyhydric alcohols with ϵ -caprolactone, polycarbonate polyols (for example, a polycarbonate diol obtained by reacting 1,6-hexanediol with diphenyl carbonate, and the like), or polyether polyols (for example, polyethylene glycol, polypropylene glycol, polytetramethylene glycol, ethylene oxide-modified bisphenol A, and the like), and the like. Of these, a polyester polyol or a polyether polyol is preferred.

10 [0035]

Examples of the polyisocyanate include isophorone diisocyanate, hexamethylene diisocyanate, tolylene diisocyanate, xylene diisocyanate, diphenylmethane-4,4'-diisocyanate, dicyclopentanyl isocyanate, and the like. Of these, isophorone diisocyanate is preferred.

15 [0036]

Examples of the hydroxy (meth)acrylate compound include hydroxyethyl (meth)acrylate, hydroxypropyl (meth)acrylate, hydroxybutyl (meth)acrylate, dimethylol cyclohexyl mono(meth)acrylate, hydroxycaprolactone (meth)acrylate, and the like. Of these, hydroxyethyl (meth)acrylate is preferred and 2-hydroxyethyl (meth)acrylate is particularly preferred.

20 [0037]

The above reaction may be carried, for example, as follows. That is, an organic polyisocyanate is mixed with a polyhydric alcohol so that the isocyanate group is preferably 1.1 to 2.0 equivalents relative to 1 equivalent of the hydroxyl group, and they are reacted at a reaction temperature of preferably 70 to 90°C to synthesize an urethane oligomer. Then a hydroxy (meth)acrylate compound is mixed therewith so that the hydroxyl group is preferably 1 to 1.5 equivalents relative to 1 equivalent of the isocyanate group of the urethane oligomer, and the intended urethane (meth)acrylate can be obtained by reacting them at 70 to 90°C. In addition, a product is commercially available as, for example, UX-0937: a polyether-based urethane acrylate (manufactured by Nippon Kayaku Co., Ltd.) and the like. The molecular weight of the urethane (meth)acrylate (C-2) is preferably approximately 400 to 10000.

25
30

[0038]

The (meth)acrylate monomer (C-3) usable as the (meth)acrylate (C) other than (A) can be used for regulating viscosity, and film strength (mechanical strength) and the kind thereof is not particularly limited. Examples of the (meth)acrylate monomer having one (meth)acryloyl group can include C8 to C18 alkyl (meth)acrylates such as isooctyl (meth)acrylate, isoamyl (meth)acrylate, lauryl (meth)acrylate, isodecyl (meth)acrylate, stearyl (meth)acrylate, cetyl (meth)acrylate, isomyristyl (meth)acrylate and tridecyl (meth)acrylate, phenoxyethyl (meth)acrylate, phenoxyethylene glycol (meth)acrylate, benzyl (meth)acrylate, tetrahydrofurfuryl (meth)acrylate, morpholine (meth)acrylate, phenylglycidyl (meth)acrylate, 2-hydroxypropyl (meth)acrylate, ethoxyethylene glycol (meth)acrylate, tricyclodecane (meth)acrylate, isobornyl (meth)acrylate, dicyclopentadieneoxyethyl (meth)acrylate, dicyclopentenyl acrylate (for example, FANCRYL FA-511A manufactured by Hitachi Chemical Co., Ltd.), dicyclopentenylmethoxyethyl acrylate (for example, FANCRYL FA-512A manufactured by Hitachi Chemical Co., Ltd.), dicyclopentenylmethoxy methacrylate (for example, FANCRYL FA-512M manufactured by Hitachi Chemical Co., Ltd.), dicyclopentenyl acrylate (for example, FANCRYL FA-513A manufactured by Hitachi Chemical Co., Ltd.), dicyclopentenyl methacrylate (for example, FANCRYL FA-513M manufactured by Hitachi Chemical Co., Ltd.), 1-adamantyl acrylate (for example, Adamantate AA manufactured by Idemitsu Kosan Co., Ltd.), 2-methyl-2-adamantyl acrylate (for example, Adamantate MA manufactured by Idemitsu Kosan Co., Ltd.), 2-ethyl-2-adamantyl acrylate (for example, Adamantate EA manufactured by Idemitsu Kosan Co., Ltd.), 1-adamantyl methacrylate (for example, Adamantate AM manufactured by Idemitsu Kosan Co., Ltd.), ethylene oxide-modified phenoxyethyl phosphate (meth)acrylate, ethylene oxide-modified butoxyethyl phosphate (meth)acrylate and ethylene oxide-modified octyloxyethyl phosphate (meth)acrylate, ethylene oxide-modified phenoxyethyl (meth)acrylate, and the like. Of these, C8 to C18 alkyl (meth)acrylates and ethylene oxide-modified phenoxyethyl (meth)acrylate are preferred. The (meth)acrylate monomer having one (meth)acryloyl group has a function of improving the mechanical properties (suppression of warping, distortion and the like) of an optical disk where the ultraviolet-curable resin composition of the present invention is formed as the light-transmitting layer.

[0039]

With regard to the (meth)acrylate monomer (C-3) usable as the (meth)acrylate (C) other than (A), the (meth)acrylate monomer having two (meth)acryloyl groups can

include cyclohexane-1,4-dimethanol di(meth)acrylate, cyclohexane-1,3-dimethanol di(meth)acrylate, tricyclodecanedimethylol di(meth)acrylate (for example, KAYARAD R-684 manufactured by Nippon Kayaku Co., Ltd., tricyclodecanedimethylol diacrylate, and the like), dioxane glycol di(meth)acrylate (for example, KAYARAD R-604 manufactured
5 by Nippon Kayaku Co., Ltd., dioxane glycol diacrylate, and the like), neopentyl glycol di(meth)acrylate, dicyclopentanyl di(meth)acrylate, 1,6-hexanediol di(meth)acrylate, alkylene oxide-modified 1,6-hexanediol di(meth)acrylate, neopentyl glycol di(meth)diacrylate, ethylene oxide-modified neopentyl glycol di(meth)acrylate, hydroxypivalic acid neopentyl glycol di(meth)acrylate, caprolactone-modified
10 hydroxypivalic acid neopentyl glycol diacrylate (KAYARAD HX-220, HX-620), polyethylene glycol di(meth)acrylate, polytetramethylene glycol diacrylate, ethylene oxide-modified bisphenol A-type di(meth)acrylate, ethylene oxide-modified phosphate di(meth)acrylate, and the like. Of these, it is preferred to use polyethylene glycol di(meth)acrylate, polytetramethylene glycol di(meth)acrylate and ethylene oxide-modified
15 bisphenol A-type di(meth)acrylate. In the present invention, particularly, it is preferred to use ethylene oxide-modified bisphenol A-type di(meth)acrylate.

[0040]

With regard to the (meth)acrylate monomer (C-3) usable as the (meth)acrylate (C) other than (A), the (meth)acrylate monomer having three (meth)acryloyl groups can
20 include trimethylolpropane tri(meth)acrylate, trimethylolpropane tri(meth)acrylate, trimethylolpropane polyethoxy tri(meth)acrylate, trimethylolpropane polypropoxy tri(meth)acrylate, trimethylolpropane polyethoxy polypropoxy tri(meth)acrylate, tris[(meth)acryloyloxyethyl]isocyanurate, caprolactone-modified tris[(meth)acryloyloxyethyl]isocyanurate, pentaerythritol tri(meth)acrylate, ethylene oxide-
25 modified trimethylolpropane tri(meth)acrylate, propylene oxide-modified trimethylolpropane tri(meth)acrylate, and the like. Of these, it is preferred to use propylene oxide (3 mol)-modified trimethylolpropane tri(meth)acrylate.

[0041]

With regard to the (meth)acrylate monomer (C-3) usable as the (meth)acrylate (C) other than (A), the (meth)acrylate monomer having four (meth)acryloyl groups can
30 include pentaerythritol polyethoxy tetra(meth)acrylate, pentaerythritol polypropoxy tetra(meth)acrylate, pentaerythritol tetra(meth)acrylate, ditrimethylolpropane tetra(meth)acrylate, dipentaerythritol tetra(meth)acrylate, and the like.

[0042]

With regard to the (meth)acrylate monomer (C-3) usable as the (meth)acrylate (C) other than (A), the (meth)acrylate monomer having five (meth)acryloyl groups can include dipentaerythritol penta(meth)acrylate, caprolactone-modified dipentaerythritol penta(meth)acrylate, and the like.

[0043]

With regard to the (meth)acrylate monomer (C-3) usable as the (meth)acrylate (C) other than (A), the (meth)acrylate monomer having six (meth)acryloyl groups can include dipentaerythritol hexa(meth)acrylate, caprolactone-modified dipentaerythritol hexa(meth)acrylate, and the like. In this regard, the (meth)acrylate monomer usable in the present invention may be also a polyfunctional one having seven or more (meth)acryloyl groups.

[0044]

In the ultraviolet-curable resin composition of the present invention, one kind or two or more kinds of these (C) components can be used as a mixture at an optional ratio. The content of the component (C) in the ultraviolet-curable resin composition is usually 0 to 80% by weight and preferably 5 to 70% by weight. Moreover, in the case where (C-1) and/or (C-2) and (C-3) are used in combination as the (C) component, (C-1) and/or (C-2) are each usually used in an amount of 5 to 70 parts by weight and preferably about 10 to 60 parts by weight relative to 100 parts by weight of photopolymerizable compound component(s) and the (C-3) component is used in an amount of 10 to 80 parts by weight and preferably 25 to 75 parts by weight relative to 100 parts by weight of photopolymerizable compound component(s). In this regard, the photopolymerizable compound component refer to a compound component having a (meth)acryloyl group.

[0045]

To the ultraviolet-curable resin composition of the present invention, an additive such as an antirust, an antioxidant, an organic solvent, a silane coupling agent, a polymerization inhibitor, a leveling agent, an antistatic agent, a surface lubricant, a fluorescent brightening agent, a light stabilizer (for example, a hindered amine compound and the like) and a filler may be added according to necessity. As the hindered amine compound, known ones can be used without particular limitation. Specific examples thereof include, for example, 1,2,2,6,6-pentamethyl-4-piperidyl alcohol, 2,2,6,6-tetramethyl-4-piperidyl alcohol, 1,2,2,6,6-pentamethyl-4-piperidyl (meth)acrylate (LA-82 manufactured by Adeka Corporation), and the like.

[0046]

The ultraviolet-curable resin composition of the present invention can be obtained by mixing and dissolving the above described components at an ordinary temperature to 80°C. In addition, according to necessity, foreign substances may be removed by an operation such as filtration. As for the ultraviolet-curable resin composition of the present invention, it is preferred to appropriately control the mixing ratio of the components so that the viscosity at 25°C is in the range of 30 to 2000 mPa.s, in view of coating properties.

[0047]

The following will specifically describe preferable embodiments of the ultraviolet-curable resin composition of the present invention.

1. An ultraviolet-curable resin composition containing (A) a (meth)acrylate having a structure represented by the above general formula (2) in an amount of 20 to 95% by weight, (B) a photopolymerization initiator in an amount of 1 to 10% by weight, and (C) a (meth)acrylate other than (A) in an amount of 0 to 80% by weight based on the whole composition.

2. The ultraviolet-curable resin composition according to the above 1, wherein the (meth)acrylate having a structure represented by the above general formula (2) is polypropylene glycol diacrylate where n equals 12 in the formula.

3. The ultraviolet-curable resin composition according to any one of the above 1 or 2, which contains at least one of (C-1) an epoxy (meth)acrylate or (C-2) a urethane acrylate as (C) the (meth)acrylate other than (A) and further contains (C-3) a (meth)acrylate monomer and wherein (C-1) and/or (C-2) are in an amount of 10 to 60 parts by weight based on 100 parts by weight of photopolymerizable compound components and (C-3) is in an amount of 20 to 75 parts by weight based on 100 parts by weight of photopolymerizable compound components.

4. The ultraviolet-curable resin composition according to any one of the above 1 to 3, wherein molecular weight of (C-1) the epoxy (meth)acrylate is 400 to 100000 and molecular weight of (C-2) the urethane (meth)acrylate is 500 to 100000.

5. The ultraviolet-curable resin composition according to any one of the above 1 to 4, wherein (C-1) the epoxy (meth)acrylate is an epoxy (meth)acrylate obtained by reacting 1 molar equivalent of the epoxy group of a bisphenol A-type epoxy resin with 1 molar equivalent of (meth)acrylic acid and (C-2) the urethane (meth)acrylate is a urethane

(meth)acrylate obtained by reacting polytetramethylene glycol, isophorone diisocyanate and hydroxyethyl (meth)acrylate in a molar ratio of 1:2:2.

6. The ultraviolet-curable resin composition according to any one of the above 1 to 5, wherein (C-3) the (meth)acrylate monomer is at least any one compound selected
5 from the group consisting of ethylene oxide-modified bisphenol A-type di(meth)acrylate, propylene oxide (3 mol)-modified trimethylolpropane tri(meth)acrylate, a C8 to C18 alkyl (meth)acrylate, ethylene oxide-modified phenoxyethyl (meth)acrylate and polyethylene glycol di(meth)acrylate, polytetramethylene glycol di(meth)acrylate.

7. The ultraviolet-curable resin composition according to any one of the above
10 1 to 6, wherein (C-3) the (meth)acrylate monomer is at least any one compound selected from the group consisting of ethylene oxide-modified bisphenol A-type di(meth)acrylate and propylene oxide (3 mol)-modified trimethylolpropane tri(meth)acrylate.

[0048]

The ultraviolet-curable resin composition of the present invention is suitably
15 used as a coating agent for a light-transmitting layer (composition for forming a light-transmitting layer) of an optical disk on which a recording layer is formed of an organic dye material. The light-transmitting layer is a layer formed on the face of an organic dye layer as the recording layer (hereinafter referred to as organic dye recording layer) at the side from which a recording/reproducing laser beam enters, directly or through another
20 layer such as an interfacial layer, and has a function of protecting the organic dye recording layer. For exhibiting the advantage of the present invention, the ultraviolet-curable resin composition of the present invention is preferably used as a composition for forming a light-transmitting layer in Blu-ray Disc where a substrate, a reflecting layer, a recording layer, an interfacial layer, and a light-transmitting layer are laminated in this order.

25 [0049]

The ultraviolet-curable resin composition of the present invention constitutes a light-transmitting layer through application thereof on the organic dye recording layer or on the interfacial layer and subsequent irradiation with an active energy ray.

The cured product obtained by irradiating the ultraviolet-curable resin
30 composition of the present invention with an active energy ray preferably has a transmittance of a light having a wavelength to be transmitted (405 nm in Blue-ray Disc) of 80% or more and the transmittance is particularly preferably 90% or more.

[0050]

It is necessary that the material for the organic dye recording layer should be sensitive to the wavelength of the laser beam to be used for recording/reproduction. Furthermore, it is necessary for the material of the organic dye recording layer that the refractive index should be altered through physical change or chemical reaction by irradiation with the laser beam. Therefore, examples of the material for the organic dye recording layer include cyanine dyes, oxonol dyes, azo dyes, phthalocyanine dyes, and porphyrin-based dyes. Using a solution obtained by mixing any of the organic materials with a solvent such as cellosolve acetate or tetrafluoropropanol, the organic dye recording layer is formed by a spin coating method. The film thickness of the organic dye recording layer is preferably 15 nm or more and 25 nm or less.

[0051]

The interfacial layer has a function of preventing mixing phenomena such as diffusion of a dye contained in the organic dye layer into the light-transmitting layer and permeation of the solvent of a curable resin for forming the light-transmitting layer into the organic dye layer. The material constituting the interfacial layer includes silicon oxides, particularly silicon dioxide, oxides such as zinc oxide, cerium oxide, yttrium oxide and indium oxide (ITO), sulfides such as zinc sulfide and yttrium sulfide, nitrides such as silicon nitride, silicon carbide, a mixture of an oxide and sulfur, a mixture of silicon dioxide and zinc sulfide, aluminum oxides, and the like. The interfacial layer is formed by a method such as sputtering.

[0052]

Moreover, the reflective layer includes Au, Ag, Al and alloys containing them as main ingredients, which have a high reflectivity in the wavelength region of visible light, particularly blue light to be used as a recording/reproducing wavelength. The reflective layer is formed by a method such as sputtering, ion plating, or an electron beam deposition method.

[0053]

As the substrate, a polycarbonate resin, a polyolefin resin, an acrylic resin, an epoxy resin, or the like, which has been commonly used for DVD, can be employed.

[0054]

As mentioned above, the ultraviolet-curable resin composition of the present invention can be used as a coating agent for light-transmitting layers on the laser incident side of Blu-ray Disc and the like. Specifically, the composition is coated on an optical disk substrate by an arbitrary method, for example, a spin coating method, a photo

polymerization method, a roll coating method, a screen printing method, and the like so that the film thickness of the applied resin is 1 to 100 μm . After coating, by irradiation with an ultraviolet to near ultraviolet ray (wavelength: around 200 to 400 nm) from one side or both sides, the composition is cured. The irradiation amount is preferably about 50 to 1500 mJ/cm^2 and particularly preferably, approximately 100 to 1000 mJ/cm^2 . For curing by irradiation with the ultraviolet to near ultraviolet ray, any lamp can be used as long as it allows irradiation of the ultraviolet to near ultraviolet ray. For example, it includes a low, high or ultrahigh pressure mercury lamp, a metal halide lamp, a (pulse) xenon lamp, an electrodeless lamp, or the like.

10 [0055]

Moreover, the ultraviolet-curable resin composition of the present invention can be applied to the case where the light-transmitting layer is composed of a plurality of layers. For example, in the case where the light-transmitting layer is composed of a first resin layer formed on the recording layer or the interfacial layer and a second resin layer formed on a face opposite to the recording layer or the interfacial layer viewing from the first resin layer, the resin composition can be preferably used as the first resin layer.

In this case, the thickness of the first resin layer is usually 1 μm to 50 μm , preferably 5 μm to 40 μm , and more preferably 10 μm to 30 μm .

20 Moreover, the thickness of the second resin layer is usually 50 μm to 100 μm , preferably 60 μm to 95 μm , and more preferably 70 μm to 90 μm .

[0056]

In the case where the light-transmitting layer is composed of two layers, as a forming method of the light-transmitting layer, specifically, the composition is coated on an optical disk substrate by an arbitrary method, for example, a spin coating method, a photo polymerization method, a roll coating method, a screen printing method, and the like so that the film thickness of the resin applied as the first resin layer is 1 to 50 μm . After coating, by irradiation with an ultraviolet to near ultraviolet ray (wavelength: around 200 to 400 nm) from one side or both sides, the composition is cured. The irradiation amount is preferably about 50 to 1500 mJ/cm^2 and particularly preferably, approximately 100 to 1000 mJ/cm^2 . After curing, the composition is coated on an optical disk substrate by an arbitrary method, for example, a spin coating method, a photo polymerization method, a roll coating method, a screen printing method, and the like so that the film thickness of the resin applied as the second resin layer is 50 μm to 100 μm . After coating, by irradiation

with an ultraviolet to near ultraviolet ray (wavelength: around 200 to 400 nm) from one side or both sides, the composition is cured. The irradiation amount is preferably about 50 to 1500 mJ/cm² and particularly preferably, approximately 100 to 1000 mJ/cm². For curing by irradiation with the ultraviolet to near ultraviolet ray, any lamp can be used as long as it allows irradiation of the ultraviolet to near ultraviolet ray. For example, it includes a low, high or ultrahigh pressure mercury lamp, a metal halide lamp, a (pulse) xenon lamp, an electrodeless lamp or the like.

[0057]

The ultraviolet-curable resin composition of the present invention can be suitably used not only in the case where the recording layer comprises an organic dye but also in the case where it comprises an inorganic compound such as a copper alloy but the composition particularly exhibits a remarkable effect in the case where the recording layer comprises an organic dye.

15 Examples

[0058]

Hereinafter, the present present invention will be explained more specifically with reference to Examples, but the present invention is not limited to these Examples.

[0059]

20 Ultraviolet-curable resin compositions of Examples 1 to 4 and Comparative Examples 1 to 2 were prepared according to the composition shown in Table 1.

[0060]

[Table 1]

	Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7	Example 8	Example 9	Comparative Example 1
Composition (A)										
M-117	85.0									
NP-5P										
AP-400		70.0								
AM-30PG			55.0							
FA-P270A					90.0	35.0	25.0	35.0	15.0	
TPGDA						20.0		20.0		
Composition (B)										
Irgacure-184	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Composition (C)										
UA-1	10.0		40.0	40.0	5.0	40.0	25.0	30.0	25.0	10.0
EA-1								10.0		
TPA-330									20.0	
BPE-10		25.0					35.0		35.0	
NPG-2P										85.0
Other component										
LA-82	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
PMP	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Jitter value (%) before durability test	6.2	6.4	6.6	6.3	6.2	6.7	6.8	6.9	7.8	15.8
Judgment	O	O	O	O	O	O	O	O	O	X
Jitter value (%) after durability test	8.3	8.5	9.0	8.5	8.2	8.6	8.6	8.8	9.5	22.2
Judgment	O	O	O	O	O	O	O	O	O	X

[0061]

In this regard, the components abbreviated in Table 1 are as follows.

M-117: propylene oxide (2.5 mol)-modified nonylphenyl acrylate, N=2.5 in the formula, manufactured by Toagosei Co., Ltd.;

NP-5P: propylene oxide (5 mol)-modified nonylphenyl acrylate, N=5 in the formula, manufactured by Dai-ichi Kogyo Seiyaku Co., Ltd.;

AP-400: propylene glycol monoacrylate, N=6 in the formula, manufactured by NOF Corporation;

AM-30PG: methoxytripropylene glycol acrylate, N=3 in the formula, manufactured by Shin-Nakamura Chemical Co., Ltd.;

FA-P270A: polypropylene glycol diacrylate, N=12 in the formula, manufactured by Hitachi Chemical Co., Ltd.;

TPGDA: tripropylene glycol diacrylate, N=3 in the formula, manufactured by Cognis;

TPA-330: propylene oxide (3 mol)-modified trimethylolpropane triacrylate, N=1 in the formula, manufactured by Nippon Kayaku Co., Ltd.;

UA-1: polytetramethylene glycol (molecular weight: 850), urethane acrylate obtained by reacting three components: polytetramethylene glycol (molecular weight: 850), isophorone diisocyanate and 2-hydroxyethyl acrylate, in a molar ratio of 1:2:2;

EA-1: epoxy acrylate obtained by reacting 1 molar equivalent of epoxy group of bisphenol A-type epoxy resin (epoxy equivalent: 185 g/eq.) with 1 molar equivalent of acrylic acid until an oxidation of 0.5 mg.KOH/g

BPE-10: ethylene oxide (10 mol)-modified bisphenol A-type diacrylate, manufactured by Dai-ichi Kogyo Seiyaku Co., Ltd.;

NPG-2P: propylene oxide (2 mol)-modified neopentyl glycol diacrylate, N=1 in the formula, manufactured by Dai-ichi Kogyo Seiyaku Co., Ltd.;

Irgacure-184: 1-hydroxycyclohexyl phenyl ketone, manufactured by Ciba Specialty Chemicals;

LA-82: 1,2,2,6,6-pentamethyl-4-piperidyl methacrylate, manufactured by ADEKA Corporation;

PMP: 4-mercaptophenol

[0062]

Using the obtained ultraviolet-curable resin compositions of the present invention, Blu-ray Disc having an organic dye recording layer was produced and evaluated for the properties.

[0063]

Production of Blu-ray Disc Having Organic Dye Recording Layer (Examples 1 to 5, Comparative Example 1)

1. A silver alloy was sputtered on a polycarbonate substrate having a diameter of 12 cm and a thickness of 1.1 mm which had a guide groove having a track pitch of 0.32 μm so that the film thickness was 100 nm, thereby producing a reflective layer.

Thereafter, a dye solution containing an azo dye dissolved in TFP (tetrafluoropropanol) solvent was applied by a spin coating method and dried at 80°C for 30 minutes to form an organic dye recording layer. Furthermore, ZnS-SiO₂ (molar ratio: 80:20) was sputtered so that the thickness was about 15 nm, thereby forming an interfacial layer to produce a Blu-ray Disc substrate.

2. The Blu-ray Disc substrate was put on a spin table so that the interfacial layer was upward, a cap treatment was carried in a circle pattern for covering it until an internal diameter of 11.5 mm, and then 2.0 g of an ultraviolet-curable resin composition of the present invention was provided on the cap of the center.

3. In accordance with the viscosity of the ultraviolet-curable resin composition of the present invention, spin coating was carried out at a rate range of 1000 rpm to 1500 rpm for 4 seconds to 7 seconds to perform coating so that each coated film thickness was 25 μm . Shortly before completion of the spin coating, irradiation of 2 shots was carried out with a xenon flash lamp to cure the composition to the degree that the surface flowability disappeared.

4. Using a high-pressure mercury lamp, irradiation at 400 mJ/cm² was carried out from the upper side for 3 seconds to completely cure the ultraviolet-curable resin composition of the present invention.

5. The resulting Blu-ray Disc substrate was put on a spin table so that the cured ultraviolet-curable resin composition of the present invention was upward, a cap treatment was carried in a circle pattern for covering it until an internal diameter of 11.5 mm, and then 3.0 g of BRD-864 (a resin for light-transmitting layer for Blu-ray

Disc manufactured by Nippon Kayaku Co., Ltd.) was provided on the cap of the center.

6. Spin coating was carried out at a rate range of 1500 rpm for 4 seconds to 7 seconds to perform coating so that coated film thickness was 75 μm . Shortly before completion of the spin coating, irradiation of 2 shots was carried out with a xenon flash lamp to cure it to the degree that the surface flowability disappeared.

7. Using a high-pressure mercury lamp, irradiation at 400 mJ/cm^2 was carried out from the upper side for 3 seconds to completely cure BRD-864 to produce Blu-ray Disc of the present invention.

[0064]

Production of Blu-ray Disc Having Organic Dye Recording Layer (Examples 6 to 9)

1. A silver alloy was sputtered on a polycarbonate substrate having a diameter of 12 cm and a thickness of 1.1 mm which had a guide groove having a track pitch of 0.32 μm so that the film thickness was 100 nm, thereby producing a reflective layer.

Thereafter, a dye solution containing an azo dye dissolved in TFP

(tetrafluoropropanol) solvent was applied by a spin coating method and dried at 80°C for 30 minutes to form an organic dye recording layer. Furthermore, ZnS-SiO₂ (molar ratio: 80:20) was sputtered so that the thickness was about 15 nm, thereby forming an interfacial layer to produce a Blu-ray Disc substrate.

2. The Blu-ray Disc substrate was put on a spin table so that the interfacial layer was upward, a cap treatment was carried in a circle pattern for covering it until an internal diameter of 11.5 mm, and then 2.0 g of an ultraviolet-curable resin composition of the present invention was provided on the cap of the center.

3. In accordance with the viscosity of the ultraviolet-curable resin composition of the present invention, spin coating was carried out at a rate ranging from 800 rpm to 1300 rpm for 4 seconds to 7 seconds to perform coating so that coated film thickness was 100 μm . Shortly before completion of the spin coating, irradiation of 2 shots was carried out with a xenon flash lamp to cure it to the degree that the surface flowability disappeared.

4. Using a high-pressure mercury lamp, irradiation at 400 mJ/cm^2 was carried out from the upper side for 3 seconds to completely cure the ultraviolet-curable resin

composition of the present invention to produce Blu-ray Disc of the present invention.

[0065]

Recording Signal Characteristic Before and After Durability Test of Blu-ray Disc

The Blu-ray Disc of the present invention and the Blu-ray Disc of Comparative Example 1 were left for 250 hours under the circumstances of 80°C and 85% RH. Using a Blu-ray Disc data signal measuring device, ODU-1000 manufactured by Pulstec Industrial Co., Ltd., the recording signal characteristic (jitter value) of the Blu-ray Disc before and after the durability test was measured and evaluated according to the following criteria. The jitter value is one of the electric signals from an optical disk, and a higher numerical value of the value means that signal data of Blu-ray Disc is more deteriorated. When the value is 10% or more, it becomes difficult to read and write the data.

Evaluation of Jitter Value

O . . . The jitter value is less than 10.0%

X . . . The jitter value is 10.0% or more.

[0066]

Test for Measuring Light Transmittance

The transmittance was determined by preparing a film of 100 μm and measuring a value of absorbance of the film at 405 nm using a spectrophotometer (U-3310, manufactured by Hitachi High-Technologies Corporation).

[0067]

From the results of Table 1, the resin compositions of the present invention in Examples 1 to 9 each containing a (meth)acrylate having a structure represented by the general formula (1) provide a good recording signal characteristic before and after the durability test. Furthermore, when light transmittance of cured products was measured by the aforementioned method, the transmittance was 85% or more in any cured products. On the other hand, a good recording signal characteristic was not obtained in Comparative Example 1.

[0068]

While the invention has been described in detail and with reference to specific embodiments thereof, it will be apparent to one skilled in the art that various

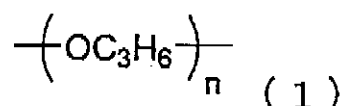
changes and modifications can be made therein without departing from the spirit and scope thereof.

The present application is based on Japanese Patent Application No. 2010-017576 filed on January 29, 2010, and the contents are incorporated herein by reference. Also, all the references cited herein are incorporated as a whole.

Claims

1. An ultraviolet-curable resin composition for an optical disk having an organic dye recording layer, the composition comprising (A) a (meth)acrylate having a structure represented by the following general formula (1) and (B) a photopolymerization initiator:

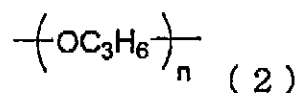
[Chem 1]



wherein n represents an integer of 2 to 16.

2. The ultraviolet-curable resin composition according to claim 1, wherein the (meth)acrylate (A) having a structure represented by the general formula (1) is the following formula (2):

[Chem 2]



wherein n represents an integer of 7 to 13.

3. The ultraviolet-curable resin composition according to claim 1 or 2, wherein the (meth)acrylate (A) having a structure represented by the general formula (1) is at least one compound selected from the group consisting of polypropylene glycol (meth)acrylate, polypropylene glycol di(meth)acrylate, polypropylene oxide-modified nonylphenyl (meth)acrylate, polypropylene oxide-modified neopentyl di(meth)acrylate, polypropylene oxide-modified 1,6-hexanediol di(meth)acrylate, polypropylene oxide-modified bisphenol A-type di(meth)acrylate, and methoxytripropylene glycol (meth)acrylate.

4. The ultraviolet-curable resin composition according to any one of claims 1 to 3, which contains (C) a (meth)acrylate other than (A).

5. The ultraviolet-curable resin composition according to any one of claims 1 to 4, wherein the (meth)acrylate (A) having a structure represented by the general formula (1) is contained in an amount of 10 to 95% by weight based on the whole composition.

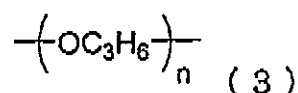
6. The ultraviolet-curable resin composition according to any one of claims 1 to 5, wherein the (meth)acrylate (C) other than (A) is at least one compound selected from the group consisting of an epoxy (meth)acrylate, a reaction product of a polyester polyol or a polyether polyol, a polyisocyanate, and a hydroxy (meth)acrylate, and ethylene oxide-modified bisphenol A-type diacrylate.

7. A cured product obtained by irradiating the ultraviolet-curable resin composition according to any one of claims 1 to 6 with an active energy ray.

8. An optical disk obtained by applying the ultraviolet-curable resin composition according to any one of claims 1 to 6 to an optical disk substrate and by irradiating the composition with an active energy ray.

9. An ultraviolet-curable resin composition to be used as a forming material for the light-transmitting layer of Blu-ray Disc having a reflective layer, an organic dye recording layer, an interfacial layer and the light-transmitting layer on a substrate in this order, the composition comprising (A) a (meth)acrylate having a structure represented by the following general formula (3) and (B) a photopolymerization initiator:

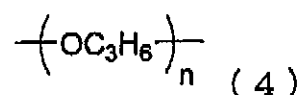
[Chem 3]



wherein n represents an integer of 2 to 16.

10. The ultraviolet-curable resin composition according to claim 9, wherein the (meth)acrylate (A) having a structure represented by the general formula (3) is the following formula (4):

[Chem 4]



wherein n represents an integer of 7 to 13.

11. Blu-ray Disc having a reflective layer, an organic dye recording layer, an interfacial layer, and a light-transmitting layer on a substrate in this order, the light-transmitting layer comprising a cured product obtained by irradiating the ultraviolet-curable resin composition according to any one of claims 1 to 6 or claims 9 to 10 with an active energy ray.