Patent Document 5: WO 2013/099640

Patent Document 6: WO 2015/068798

Summary

[0019a]

In a first aspect, the present disclosure refers to a photochromic curable composition comprising:

(A) a polyrotaxane monomer wherein, in a polyrotaxane compound having a composite molecular structure composed of an axial molecule and a plurality of cyclic molecules threaded onto the axial molecule, and side chains having OH groups introduced into the cyclic molecules, OH groups in the side chains are modified with a compound having a radical-polymerizable group;

(B) a photochromic compound; and

(C) a polymerizable monomer other than the (A) polyrotaxane monomer;

characterized in that:

the ratio of modification with the compound having a radical-polymerizable group is more than 70 mol% to 95 mol% or less,

the ratio of modification with a compound not containing a radical-polymerizable group is 0 mol% or more to less than 30 mol%, and

the ratio of unmodified OH groups is 0 mol% or more to less than 30 mol%,
on the basis of 100 mol% of OH groups in the side chains contained in the polyrotaxane compound;
or
the ratio of modification with the compound having a radical-polymerizable group is 1 mol% or more to less than 40 mol%,
the ratio of modification with a compound not containing a radical-polymerizable group is more than 0 mol% to 65 mol% or less, and
the ratio of unmodified OH groups is 0 mol% or more to 60 mol% or less,
on the basis of 100 mol% of OH groups in the side chains contained in the polyrotaxane compound.

[0019b]

In another aspect, the present disclosure refers to a cured body obtained by curing the photochromic curable composition disclosed herein.

[0019c]

In yet another aspect, the present disclosure refers to a

photochromic laminate, wherein the cured body disclosed herein is laminated on an optical substrate.

Technical Problem

[0020]

According to Patent Document 6, excellent photochromic

curable compositions and cured bodies thereof can be obtained by adding a polyrotaxane compound, but the examination by the present inventors revealed the possibility of improvement on the following points. When photochromic curable compositions using the polyrotaxane compounds specifically disclosed in the examples of Patent Document 6 were used, some of the obtained cured bodies had cracks, distortions, and the like, which were assumed to require further improvement. This tendency was especially notable when a photochromic laminate was produced by a coating method.

[0021]

Accordingly, an object of the present invention is to provide a cured body with excellent quality having photochromic properties superior in both color optical density and fading speed and a photochromic curable composition capable of increasing the yield of the cured body, particularly, to provide a photochromic composition for coating which allows

CLAIMS

[Claim 1]

A photochromic curable composition comprising:

(A) a polyrotaxane monomer wherein, in a polyrotaxane compound having a composite molecular structure composed of an axial molecule and a plurality of cyclic molecules threaded onto the axial molecule, and side chains having OH groups introduced into the cyclic molecules, OH groups in the side chains are modified with a compound having a radical-polymerizable group;

(B) a photochromic compound; and

(C) a polymerizable monomer other than the (A) polyrotaxane monomer;

characterized in that:

the ratio of modification with the compound having a radical-polymerizable group is more than 70 mol% to 95 mol% or less,

the ratio of modification with a compound not containing a radical-polymerizable group is 0 mol% or more to less than 30 mol%, and

the ratio of unmodified OH groups is 0 mol% or more to less than 30 mol%,

on the basis of 100 mol% of OH groups in the side chains contained in the polyrotaxane compound;

or

the ratio of modification with the compound having a radical-polymerizable group is 1 mol% or more to less than 40 mol%, the ratio of modification with a compound not containing a radical-polymerizable group is more than 0 mol% to 65 mol% or less, and
the ratio of unmodified OH groups is 0 mol% or more to 60 mol% or less,
on the basis of 100 mol% of OH groups in the side chains contained in the polyrotaxane compound.

[Claim 2]

The photochromic curable composition according to Claim 1, wherein the radical-polymerizable group in the (A) polyrotaxane monomer is a (meth)acrylate group.

[Claim 3]

The photochromic curable composition according to Claim 1, wherein the cyclic molecules in the (A) polyrotaxane monomer are cyclodextrin rings.

[Claim 4]

The photochromic curable composition according to Claim 1, wherein in the (A) polyrotaxane monomer, the axial molecule threaded through the rings of the cyclic molecules

has a chain structure having a bulky group at both ends, the chain structure moiety is composed of polyethylene glycol, and the bulky group at both ends is an adamantyl group.

[Claim 5]

The photochromic curable composition according to Claim 1, wherein the side chains having OH groups in the polyrotaxane compound are derived from a lactone-based compound.

[Claim 6]

The photochromic curable composition according to Claim 1, comprising 0.0001 to 10 parts by mass of the (B) photochromic compound when the total amount of the (A) polyrotaxane monomer and the (C) polymerizable monomer other than the (A) polyrotaxane monomer is regarded as 100 parts by mass.

[Claim 7]

The photochromic curable composition according to Claim 1, comprising 0.1 to 50 parts by mass of the (A) polyrotaxane monomer when the total amount of the (A) polyrotaxane monomer and the (C) polymerizable monomer other than the (A) polyrotaxane monomer is regarded as 100 parts by mass.

[Claim 8]

The photochromic curable composition according to Claim 1, wherein

(C1) a bifunctional (meth)acrylate monomer having two (meth)acrylate groups in its molecule is 30 to 80% by mass;

(C2) a polyfunctional (meth)acrylate monomer having three or more (meth)acrylate groups in its molecule is 10 to 50% by mass; and

(C3) a monofunctional (meth)acrylate monomer having a single (meth)acrylate group is 0 to 20% by mass,

when the total of the (C) polymerizable monomers other than the (A) polyrotaxane monomer is regarded as 100% by mass.

[Claim 9]

A cured body obtained by curing the photochromic curable composition according to Claim 1.

[Claim 10]

A photochromic laminate, wherein the cured body according to Claim 9 is laminated on an optical substrate.