upon heating has been added beforehand (see, for example, patent document 2), and a positive type photosensitive resin composition comprising an alkali-soluble resin, a quinone diazide compound, a thermally coloring compound that colors upon heating and exhibits an absorbance maximum at 350 nm or more and 700 nm or less, and a compound that has no absorbance maximum at 350 nm or more and less than 500 nm and has an absorbance maximum at 500 nm or more and 750 nm or less (see, for example, patent document 3). These are technologies of reducing the transmittance of a cured film while keeping the transmittance in the exposure wavelength region of the resin film before curing high by using a coloring compound that colors due to energy, such as heat. Therefore, these can impart both positive photosensitivity and negative photosensitivity to resin compositions with high versatility.

Prior art documents

Patent Documents

[Patent Document 1] JP 2008-122501 A

[Patent Document 2] JP 10-170715 A

[Patent Document 3] US Patent Application Publication No. 2004/197703 Specification

SUMMARY

[Problems to be solved]

Coloring compounds are compounds that will have intramolecular structural change themselves due to heat to develop absorption in a specified wavelength region. Recently, not only coloring compounds but also resin compositions capable of developing absorption in an exposure wavelength region by other means have been demanded in order to improve versatility. Then, an object of the present disclosure is to provide a resin composition that can reduce the transmittance in the visible region of a cured film by the use of a combination of specific compounds while maintaining the transmittance of the resin film before curing.

MEANS TO SOLVE THE PROBLEMS

That is, the present disclosure provides a resin composition comprising (a) a polyimide, a polybenzoxazole, a polyimide precursor, or a polybenzoxazole precursor, (b) 1,5-dihydroxynaphthalene, 1,6-dihydroxynaphthalene, 1,7-dihydroxynaphthalene, or 2,3-dihydroxynaphthalene, and (c) a thermal cross-linking agent having a structure represented by the following formula (1) or a thermal cross-linking agent having a group represented by the following formula (2):

[kagaku 1]

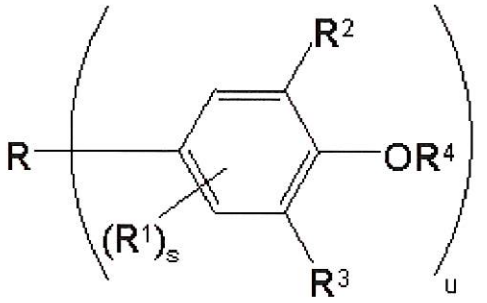
in formula (1), R represents a linking group having 2 to 4 valencies, R^1 represents a monovalent organic group having 1 to 20 carbon atoms, Cl, Br, I, or F, R^2 and R^3 each represent

CH_2OR^5 (R^5 is a hydrogen atom or a monovalent hydrocarbon group having 1 to 6 carbon atoms), R4 represents a hydrogen atom, a methyl group or an ethyl group, s represents an integer of 0 to 2 and u represents an integer of 2 to 4;

$-N(CH_2OR^6)_t(H)_v$ (2)

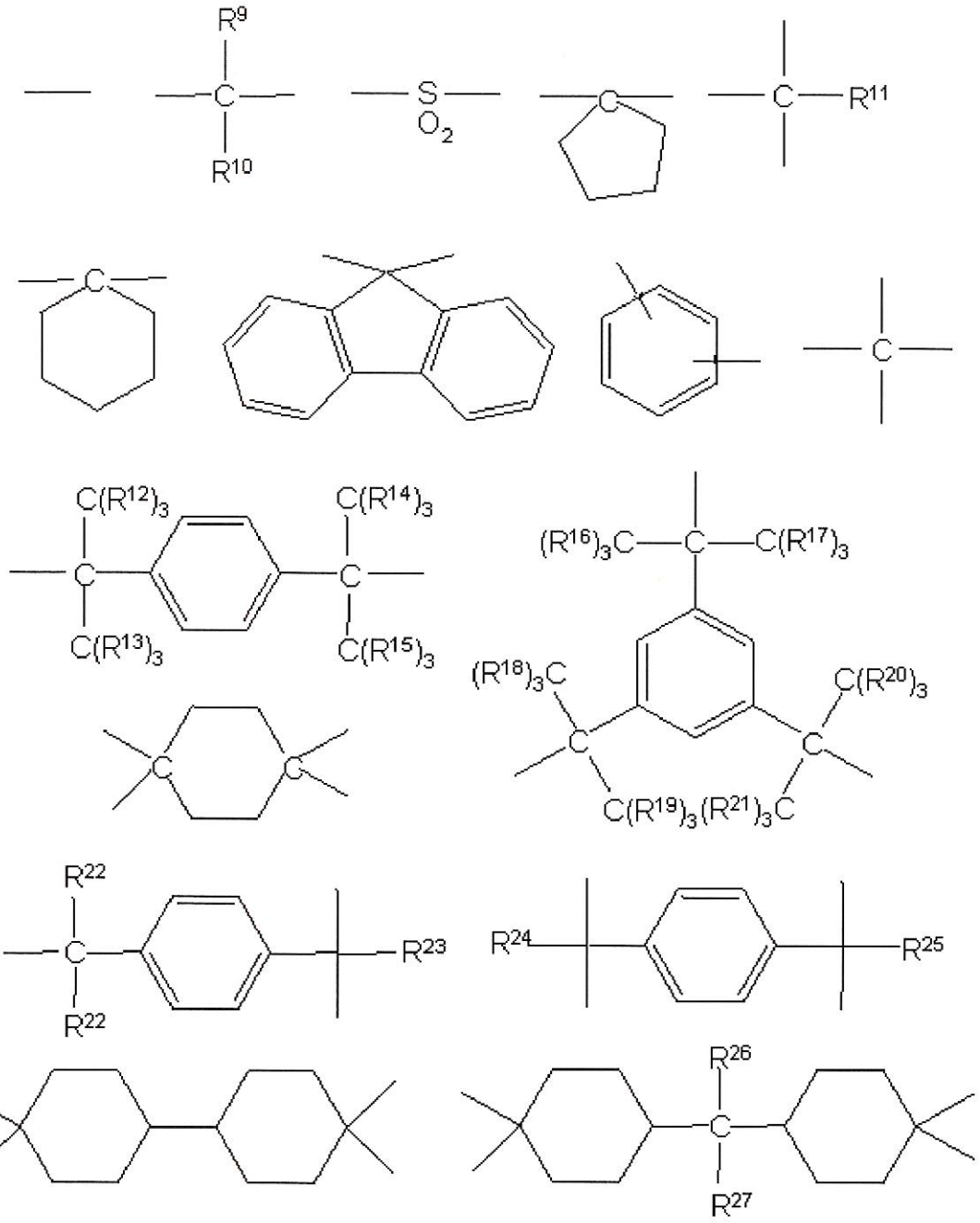
wherein in formula (2), R^6 represents a hydrogen atom or a monovalent hydrocarbon group having 1 to 6 carbon atoms, t is 1 or 2 and v is 0 or 1, provided that t + v is 1 or 2.

In an aspect, there is provided a resin composition comprising (a) a polyimide, a polybenzoxazole, a polyimide precursor, or a polybenzoxazole precursor, (b) 1,5-dihydroxynaphthalene, 1,6-dihydroxynaphthalene, 1,7-dihydroxynaphthalene, or 2,3-dihydroxynaphthalene, and (c) a thermal cross-linking agent having a structure represented by the following formula (1) or a thermal cross-linking agent having a group represented by the following formula (2):



(1)

R:



wherein in formula (1), R^1 represents a monovalent hydrocarbon groups having 1 to 6 carbon atoms, Cl, Br, I, or F, R^2 and R^3 each represent CH_2OR^5 (R^5 is a monovalent hydrocarbon group having 1 to 4 carbon atoms), R^4 represents a hydrogen atom, a methy group or an ethyl group, s represents an integer of 0 to 2 and u represents an integer of 2 to 4, R^9 to R^{27} each represent a hydrogen group,

a monovalent organic group having 1 to 20 carbon atoms, Cl, Br, I, or F;

$$-N(CH_2OR^6)_t(H)_v \quad (2)$$

wherein in formula (2), R^6 represents a hydrogen atom or a monovalent hydrocarbon group having 1 to 6 carbon atoms, t is 1 or 2 and v is 0 or 1, provided that t + v is 1 or 2.

In another aspect, there is provided a positive type photosensitive resin composition comprising the resin composition as defined above and further (d) a photo acid generator selected from any one of quinone diazide compounds, sulfonium salts, phosphonium salts, diazonium salts, and iodonium salts.

In another aspect, there is provided a negative type photosensitive resin composition comprising the resin composition as defined above and further (e) a photopolymerization initiator which generates active radicals in the part exposed to light and (f) a compound having two or more ethylenically unsaturated bonds selected from any one of ethylene glycol dimethacrylate, ethylene glycol diacrylate, diethylene glycol dimethacrylate, trimethylolpropane triacrylate, ethoxylated bisphenol A dimethacrylate, glycerin dimethacrylate, tripropylene glycol dimethacrylate, butanediol dimethacrylate, glycerin triacrylate, pentaerythritol triacrylate, pentaerythritol tetraacrylate, dipentaerythritol hexaacrylate, ethoxylated pentaerythritol tetraacrylate, and ethoxylated isocyanuric acid triacrylate.

In another aspect, there is provided a display device

comprising a substrate in which a thin film transistor has been formed, a planarization film and/or a dielectric layer obtained by curing the resin composition as defined above, and a display element in this order.

EFFECT

According to the present disclosure, it is possible to obtain a resin composition that can reduce the transmittance in the visible region of a cured film while maintaining the transmittance of the resin film before curing.

BRIEF DESCRIPTION OF THE DRAWING

Fig. 1 is a sectional view of a TFT substrate in which a planarization film and a dielectric layer have been formed.

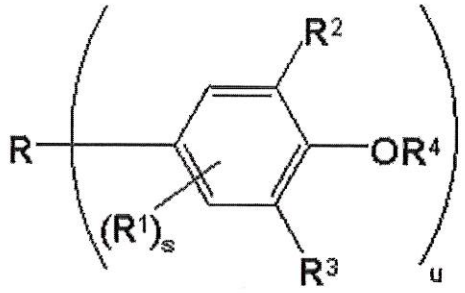
Fig. 2 is a sectional view of a TFT substrate in which a dielectric layer has been formed.

Fig. 3 is a transmission spectra of the resin composition of Example 2 before and after curing.

Fig. 4 is a transmission spectra of the resin composition of Comparative Example 3 before and after curing.

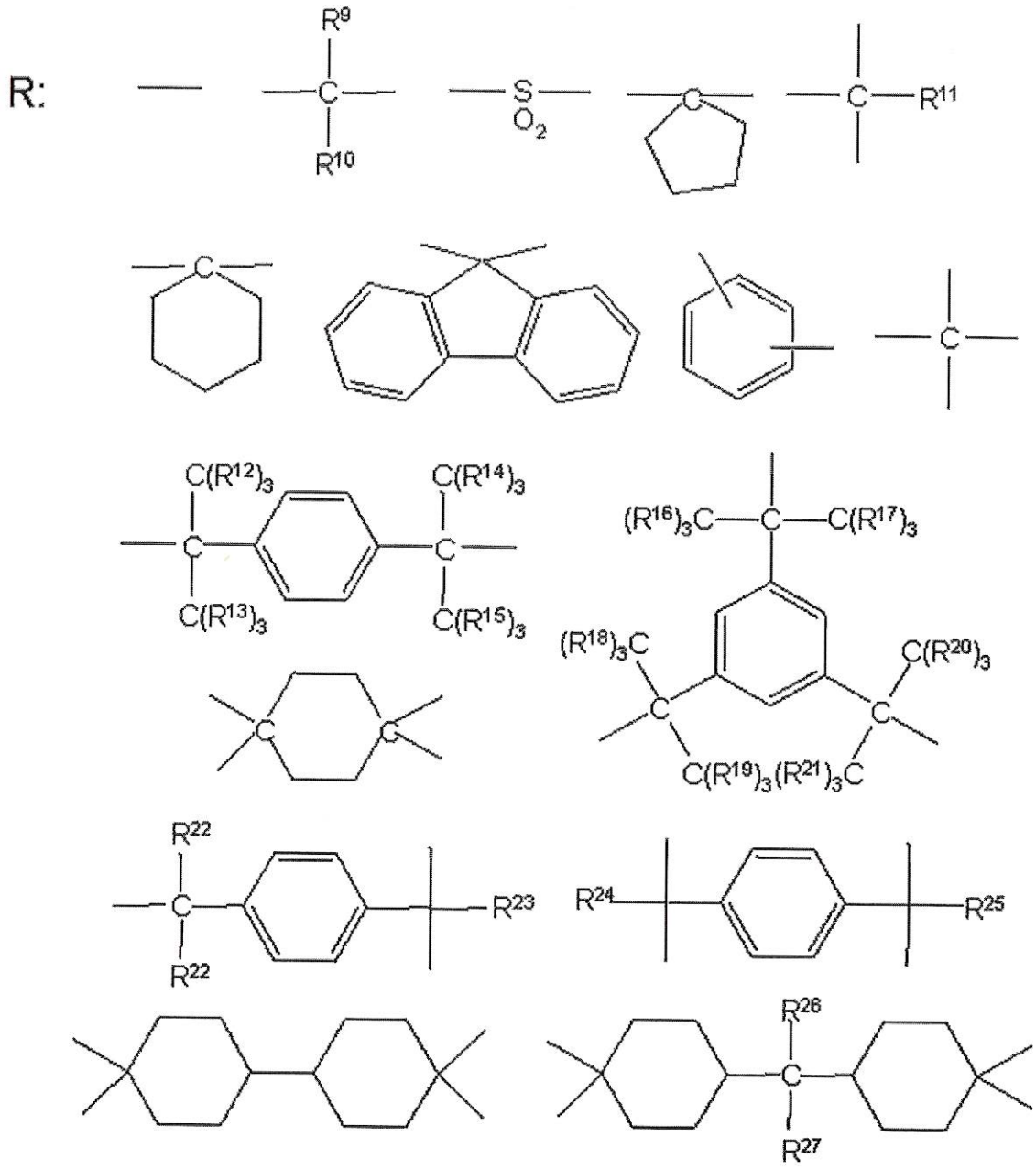
CLAIMS

1. A resin composition comprising (a) a polyimide, a polybenzoxazole, a polyimide precursor, or a polybenzoxazole precursor, (b) 1,5-dihydroxynaphthalene, 1,6-dihydroxynaphthalene, 1,7-dihydroxynaphthalene, or 2,3-dihydroxynaphthalene, and (c) a thermal cross-linking agent having a structure represented by the following formula (1) or a thermal cross-linking agent having a group represented by the following formula (2):



(1)

R:



wherein in formula (1), R^1 represents a monovalent hydrocarbon groups having 1 to 6 carbon atoms, Cl, Br, I, or F, R^2 and R^3 each represent CH_2OR^5 (R^5 is a monovalent hydrocarbon group having 1 to 4 carbon atoms), R^4 represents a hydrogen atom, a methy group or an ethyl group, s represents an integer of 0 to 2 and u represents an integer

of 2 to 4, R^9 to R^{27} each represent a hydrogen group, a monovalent organic group having 1 to 20 carbon atoms, Cl, Br, I, or F;

$$-N(CH_2OR^6)_t(H)_v \quad (2)$$

wherein in formula (2), R^6 represents a hydrogen atom or a monovalent hydrocarbon group having 1 to 6 carbon atoms, t is 1 or 2 and v is 0 or 1, provided that t + v is 1 or 2.

2. The resin composition according to claim 1, wherein component (b) is used to reduce transmittance in the visible range of a cured film obtained by the resin composition.

3. A positive type photosensitive resin composition comprising the resin composition according to claim 1 and further (d) a photo acid generator selected from any one of quinone diazide compounds, sulfonium salts, phosphonium salts, diazonium salts, and iodonium salts.

4. A negative type photosensitive resin composition comprising the resin composition according to claim 1 and further (e) a photopolymerization initiator which generates active radicals in the part exposed to light and (f) a compound having two or more ethylenically unsaturated bonds selected from any one of ethylene glycol dimethacrylate, ethylene glycol diacrylate, diethylene glycol dimethacrylate, trimethylolpropane triacrylate, ethoxylated bisphenol A dimethacrylate, glycerin dimethacrylate, tripropylene glycol dimethacrylate, butanediol dimethacrylate, glycerin triacrylate, pentaerythritol triacrylate, pentaerythritol tetraacrylate, dipentaerythritol hexaacrylate, ethoxylated pentaerythritol tetraacrylate, and ethoxylated isocyanuric acid triacrylate.

5. The resin composition according to any one of claims 1 to 4, wherein the change in transmission of light having a wavelength of 450 nm before and after cure in a film having a thickness of 3.0 μm is 20% or more.

6. A display device comprising a substrate in which a thin film transistor has been formed, a planarization film and/or a dielectric layer obtained by curing the resin composition according to any one of claims 1 to 5, and a display element in this order.

7. The display device according to claim 6, wherein the display element is an organic electroluminescent element.