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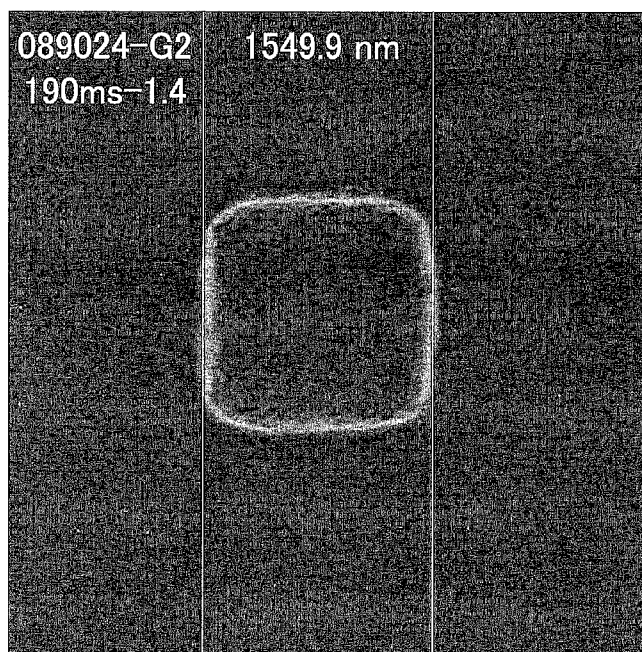
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[Continued on next page]

(54) Title: PIGMENT DISPERSION COMPOSITION AND COLOR RESIST COMPOSITION INCLUDING THE SAME AND COLOR FILTER USING THE SAME

【FIG. 1】



(57) Abstract: The present invention related to a pigment dispersion composition, a color resist composition including the same, and a color filter fabricated by using the color resist composition. The pigment dispersion composition includes [A] a pigment, [B] a dispersing agent, [C] a cardo-based binder resin, and [D] a solvent.



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【SPECIFICATION】**【Invention Title】**

PIGMENT DISPERSION COMPOSITION AND COLOR RESIST
COMPOSITION INCLUDING THE SAME AND COLOR FILTER USING THE
5 SAME

【Technical Field】

The present invention relates to a pigment dispersion composition, a
color resist composition including the same, and a color filter fabricated using the
same. More particularly, the present invention relates to a pigment dispersion
10 composition that is capable of reducing pattern residues and improving
resolution, a color resist composition including the same, and a color filter made
using the same.

【Background Art】

An image sensor is a part for photographing images in a device such as
15 a portable phone camera or a digital still camera (DSC). An image sensor can
be classified as a charge-coupled device (CCD) image sensor or a
complementary metal oxide semiconductor (CMOS) image sensor, depending
on the manufacturing process and the method of using the same.

A color photographing part for a charge-coupled device (CCD) image
20 sensor or a complementary metal oxide semiconductor (CMOS) image sensor
includes color filters, each having additive mixing primary color filter segments of
red, green, and blue, and the colors are separated.

A recent color filter embodied in the color photographing part has a

pattern size of 2 μm or less, which is 1/100th to 1/200th of the pattern size of a conventional color filter pattern for LCDs. Accordingly, increased resolution and decreased pattern residues are important factors for determining the performance of a device.

5 It is believed that the kind and composition ratio of a photoinitiator, a monomer, and a binder, and the pigment dispersion solution, determine whether the resolution is increased and the pattern residues are decreased. Furthermore, in order to provide a fine pattern, the pigment dispersion solution should be prepared to have a small particle diameter and a composition that
10 does not leave pattern residues when developing an image. In order to decrease the dispersing particle diameter of the pigment dispersion solution, the pigment should have a small primary particle diameter, and the kind and amount of a dispersing agent should be considered.

Recent pigments for an electron material have a primary particle size of
15 approximately 50nm. Therefore, when they are dispersed, they can have a smaller dispersion particle size. A dispersing agent is used to maintain dispersion of a pigment by introducing a functional group that can be adhered to the surface of the pigment and adjusting pigment particles to have a predetermined distance using steric hindrance effects. The dispersing agents
20 are classified into polyesters, acryl resins, modified urethane resins, polyethers, and the like, which can sufficiently provide steric hindrance to a pigment.

Accordingly, when a pigment having a small primary particle size is used with a dispersing agent that can be well adhered to the surface of the pigment and disperse pigment particles through steric hindrance effects, it can be finely

dispersed. Herein, a dispersion solution is prepared by using another dispersing agent that can decrease residues during the development. When a color resist is prepared by using this pigment dispersion solution, it can accomplish a fine pattern.

5 **【DETAILED DESCRIPTION】**

【Technical Problem】

One embodiment of the present invention provides a pigment dispersion composition that has excellent pigment dispersion and development properties in order to decrease pattern residue and improve resolution.

10 **【Technical Solution】**

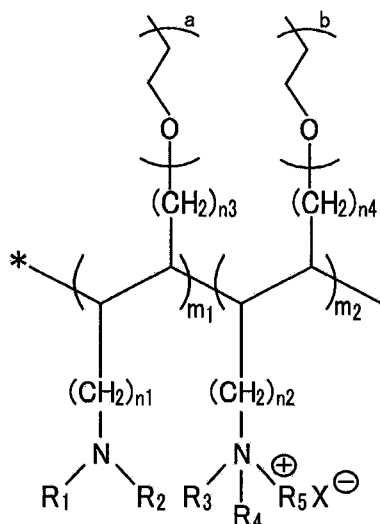
Another embodiment of the present invention provides a resist composition for a color filter including the pigment dispersion composition.

Another embodiment of the present invention provides a color filter made using the resist composition for a color filter.

15 The embodiments of the present invention are not limited to the above technical purposes, and a person of ordinary skill in the art can understand other technical purposes.

 According to one embodiment of the present invention, a pigment dispersion composition is provided that includes [A] a pigment, [B] a dispersing agent of the following Formula 1, [C] a cardo-based binder resin of the following
20 Formula 2, and [D] a solvent.

[Chemical Formula 1]



In the above Formula 1,

R₁ to R₅ are the same or different, and are independently selected from the group consisting of hydrogen, a substituted or unsubstituted alkyl, a substituted or unsubstituted alkenyl, a substituted or unsubstituted alkynyl, a substituted or unsubstituted aryl, a substituted or unsubstituted heteroaryl, a substituted or unsubstituted arylalkyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted heterocycloalkyl, a substituted or unsubstituted cycloalkenyl, a substituted or unsubstituted cycloalkynyl, a substituted or unsubstituted alkoxy, a substituted or unsubstituted alkylamino, a substituted or unsubstituted alkoxy amino, and a substituted or unsubstituted alkanol,

X is selected from the group consisting of a halogen, a sulfone, an alkylsulfone, and a hydroxy,

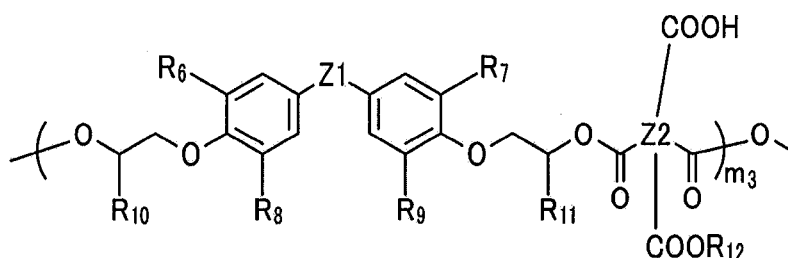
m₁ ranges from 30 to 100mol%,

m₂ ranges from 0 to 70mol%,

n_1 to n_4 are the same or different, and are independently integers of 1 to 20, and

a and b are the same or different, and are independently integers of 0 to 18.

5 [Chemical Formula 2]



In the above Formula 2,

R_6 to R_9 are the same or different, and are independently selected from the group consisting of hydrogen, a halogen, and a substituted or unsubstituted alkyl,

R_{10} and R_{11} are the same or different, and are independently $\text{CH}_2\text{OR}_{13}$ where R_{13} is an acryl, a vinyl, or a methacryl,

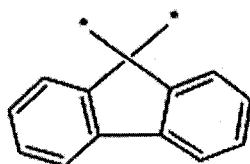
R_{12} is selected from the group consisting of hydrogen, an alkyl, an acryl, a vinyl, and a methacryl,

15 Z_1 is selected from the group consisting of CO, SO_2 , $\text{CR}_{14}\text{R}_{15}$, $\text{SiR}_{16}\text{R}_{17}$ (wherein R_{14} to R_{17} are the same or different, and are independently selected from the group consisting of hydrogen, a fluoroalkyl, and an alkyl), O, a single bond, and one represented by the following Formulae 4 to 14,

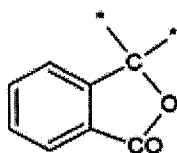
Z_2 is a moiety derived from acid anhydride or acid dianhydride, and

20 m_3 is an integer ranging from 1 to 40.

[Chemical Formula 4]

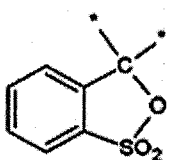


[Chemical Formula 5]

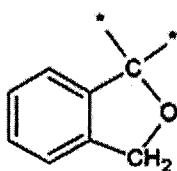


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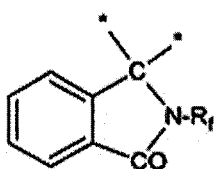
[Chemical Formula 6]



[Chemical Formula 7]



[Chemical Formula 8]

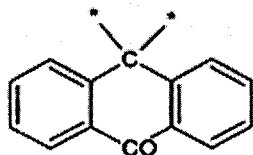


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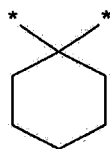
In the above Formula 8,

R_1 is selected from the group consisting of hydrogen, an ethyl, C_2H_4Cl , C_2H_4OH , $CH_2CH=CH_2$, and a phenyl.

[Chemical Formula 9]

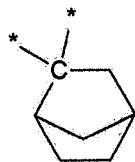


[Chemical Formula 10]

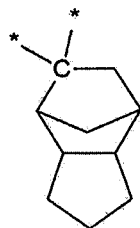


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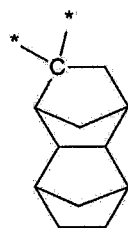
[Chemical Formula 11]



[Chemical Formula 12]

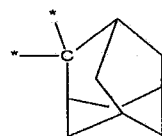


[Chemical Formula 13]



10

[Chemical Formula 14]



Another embodiment of the present invention provides a resist

composition for a color filter including the pigment dispersion composition.

A further embodiment of the present invention provides a color filter made using the resist composition for a color filter.

Further embodiments of the present invention will also be described in
5 detail.

【Advantageous Effects】

According to the embodiment of the present invention, a pigment dispersion composition can be finely dispersed. When the pigment dispersion composition is prepared into a color resist composition, the color resist
10 composition can form a fine pattern with high resolution but has remarkably decreased residue. Accordingly, when it is used for a solid image sensor and a color filter for a metal oxide semiconductor image sensor, or an LCD display device, it can accomplish excellent sensitivity and image resolution.

【Brief Description of the Drawings】

15 FIG. 1 is a SEM (scanning electron microscope) photograph of a pattern fabricated using the color resist including the pigment dispersion composition according to Example 1.

FIG. 2 is a SEM (scanning electron microscope) photograph of a pattern fabricated using the color resist including the pigment dispersion composition
20 according to Example 4.

FIG. 3 is a SEM (scanning electron microscope) photograph of a pattern fabricated using the color resist including the pigment dispersion composition according to Comparative Example 3.

FIG. 4 is a SEM (scanning electron microscope) photograph of a pattern fabricated using the color resist including the pigment dispersion composition according to Comparative Example 4.

【Best Mode】

5 The present invention will be described more fully hereinafter in the following detailed description of the invention, in which some but not all embodiments of the invention are described. Indeed, this invention may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that
10 this disclosure will satisfy applicable legal requirements. Like numbers refer to like elements throughout the specification.

 The pigment dispersion composition according to one embodiment of the present invention includes [A] a pigment, [B] a dispersing agent of the following Formula 1, [C] a cardo-based binder resin of the following Formula 2, and [D] a
15 solvent.

 As used herein, when specific definition is not provided, the term "an alkyl" refers to a C1 to C15 alkyl, the term "an alkenyl" refers to a C2 to C16 alkenyl, the term "an alkynyl" refers to a C2 to C16 alkynyl, the term "an aryl" refers to a C6 to C18 aryl, the term "a heteroaryl" refers to a C2 to C16 hetero
20 aryl, the term "an arylalkyl" refers to a C7 to C18 arylalkyl, the term "cycloalkyl" refers to a C3 to C15 cycloalkyl, the term "a heterocycloalkyl" refers to a C3 to C20 heterocycloalkyl, the term "a cycloalkenyl" refers to a C3 to C15 cycloalkenyl, the term "a cycloalkynyl" refers to a C6 to C15 cycloalkynyl, and the term "an alkoxy" refers to a C1 to C20 alkoxy.

The heteroaryl and heterocycloalkyl refer to an alkyl and cycloalkyl including 1 to 3 heteroatoms selected from the group consisting of N, O, S, and P.

As used herein, when specific definition is not provided, the term "substituted" refers to one substituted with at least a substituent selected from the group consisting of a halogen (F, Br, Cl, or I), a hydroxyl, an alkoxy, a nitro, a cyano, an amino, an azido, an amidino, a hydrazino, a hydrazono, a carbonyl, a carbamyl, a thiol, an ester, a carboxyl or a salt thereof, sulfonic acid or a salt thereof, phosphoric acid or a salt thereof, a C1 to C15 alkyl, a C2 to C16 alkenyl, a C2 to C16 alkynyl, a C6 to C18 aryl, a C7 to C18 arylalkyl, a C3 to C15 cycloalkyl, a C3 to C15 cycloalkenyl, and a C6 to C15 cycloalkynyl.

Hereinafter, the components of the pigment dispersion composition according to one embodiment of the present invention are illustrated in detail.

[A] Pigment

The pigment may be an organic pigment or an inorganic pigment. Specific examples of the pigment include red dipyrrolopyrrol pigments such as C. I. red pigments 254, 255, 264, 270, or 272; red anthraquinone pigments such as C. I. red pigment 177 or 89; green halogen-substituted copper phthalocyanine pigments such as C. I. green pigment 36 or C. I. green pigment 7; blue copper phthalocyanine pigments such as C. I. blue pigment 15:6, 15, 15:1, 15:2, 15:3, 15:4, 15:5, or 16; yellow isoindoline pigments such as C. I. yellow pigment 139; yellow quinophthalone pigment such as C. I. yellow pigment 138; yellow nickel complex pigment such as C. I. yellow pigment 150, and the like. The pigments may be used singularly or in combination.

The pigment may be selectively pretreated with water-soluble inorganic salts and a wetting agent.

When the pigment is pretreated, it can have a finer primary particle size. This pretreatment process includes a step S1 of kneading a pigment with a water-soluble inorganic salt and a wetting agent and another step S2 of filtrating and washing the acquired pigment.

The kneading may be performed at 40 to 100° C.

The water-soluble inorganic salt is added to knead a pigment, and representatively includes sodium chloride, potassium chloride, or the like, but is not limited thereto.

The wetting agent may be added along with the water-soluble inorganic salts. This allows the pigment to be uniformly mixed with the inorganic salts and be pulverized. Examples of the pigment include alkylene glycol monoalkyl ethers such as ethyleneglycol monoethyl ether, propyleneglycol monomethyl ether, diethylene glycolmonomethyl ether, and so on, and alcohols such as ethanol, isopropanol, butanol, hexanol, cyclohexanol, ethyleneglycol, diethylene glycol, polyethylene glycol, glycerine polyethylene glycol, and the like. These may be used singularly or in combination.

The pigment is measured after the kneading regarding average particle diameter by using a transmission electron microscope (TEM).

The filtration and washing process is performed by washing the inorganic salt by using water and the like.

According to the embodiment of the present invention, the pigment has an average particle diameter ranging from 30 to 100nm

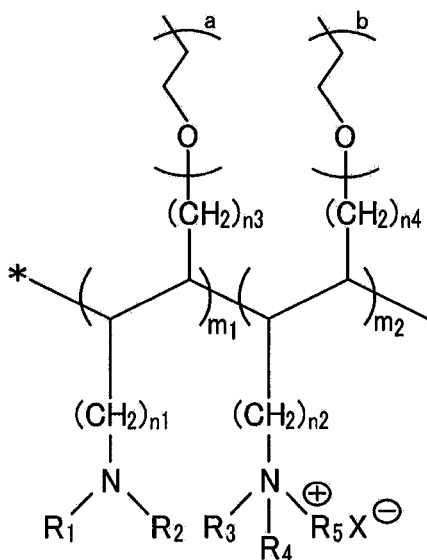
When it has an average particle diameter (D50) of 30nm or less, the prepared pattern has decreased durability such as with regard to heat-resistance, photo-resistance, and the like. When it has an average particle diameter of 100nm or more, it is difficult to form a fine pattern.

5 **[B] Dispersing agent**

The dispersing agent may be represented by the following Formula 1.

The first dispersing agent represented by the following Formula 1 can secure dispersion stability of a pigment dispersion solution and improve developability when it is prepared into a color resist.

10 **[Chemical Formula 1]**



In the above Formula 1,

R₁ to R₅ are the same or different, and are independently selected from the group consisting of hydrogen, a substituted or unsubstituted alkyl, a substituted or unsubstituted alkenyl, a substituted or unsubstituted alkynyl, a substituted or unsubstituted aryl, a substituted or unsubstituted heteroaryl, a

substituted or unsubstituted arylalkyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted heterocycloalkyl, a substituted or unsubstituted cycloalkenyl, a substituted or unsubstituted cycloalkynyl, a substituted or unsubstituted alkoxy, a substituted or unsubstituted alkyl amino, a substituted or unsubstituted alkoxy amino, and a substituted or unsubstituted alkanol,

X is selected from the group consisting of a halogen, a sulfone, an alkylsulfone, and a hydroxy,

m_1 ranges from 30 to 100mol%, and preferably 50 to 100mol%,

m_2 ranges from 0 to 70mol%, and preferably 0 to 50mol%,

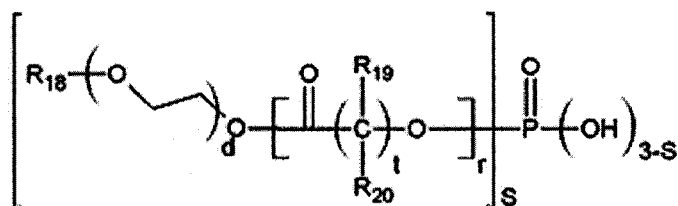
n_1 to n_4 are the same or different, and are independently integers ranging from 1 to 20, and

a and b are the same or different, and are independently integers ranging from 0 to 18.

The dispersing agent represented by the above Formula 1 may be used in an amount of 10 to 80 parts by weight based on 100 parts by weight of a pigment. Within the above range, appropriate viscosity may be obtained, thereby improving optical, physical, and chemical characteristics of the resultant products.

In addition, a first dispersing agent represented by the above Formula 1 can be mixed with a second dispersing agent represented by the following Formula 3.

[Chemical Formula 3]



In the above Formula 3,

R_{18} and R_{20} are the same or different, and are independently selected

5 from the group consisting of hydrogen, a substituted or unsubstituted alkyl, a substituted or unsubstituted alkenyl, a substituted or unsubstituted alkynyl, a substituted or unsubstituted aryl, a substituted or unsubstituted heteroaryl, a substituted or unsubstituted arylalkyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted heterocycloalkyl, a substituted or unsubstituted

10 cycloalkenyl, a substituted or unsubstituted cycloalkynyl, a substituted or unsubstituted alkoxy, a substituted or unsubstituted alkyl amino, a substituted or unsubstituted alkoxy amino, and a substituted or unsubstituted alkanol,

d is an integer ranging from 0 to 20,

t is an integer ranging from 1 to 20,

15 r is an integer ranging from 1 to 40, and

s is an integer ranging from 1 to 2.

The second dispersing agent may include DISPERBYK[®]-111, DISPERBYK[®]-110, and the like, made by BYK Co.

When the second dispersing agent is further mixed to prepare a pigment,

20 the pigment has improved dispersion and much improved development.

When the first and second dispersing agents are mixed and used

together, they are mixed in a weight ratio of 99:1 to 50:50. In another embodiment, they may be mixed in a weight ratio of 90:10 to 60:40. When they are mixed within the range, they can contribute to securing optimal fine dispersion and improving development when it is prepared into a color resist.

5 The first and second dispersing agents are used in an amount of 10 to 80 parts by weight based on 100 parts by weight of a pigment. Within the above range, appropriate viscosity may be obtained, thereby improving physical, optical, and chemical characteristics of the resultant products.

 In addition, the pigment dispersion composition may further include a
10 third dispersing agent when needed. The third dispersing agent may include polycarbonic acid ester, unsaturated polyamide, polycarbonic acid, polycarbonic acid alkyl amine salt, polyacryl, polyethyleneimine, polyurethane, polyether, acryl resin, phosphoric acidester, modified urethane, and the like. They can be used as singularly or as a mixture of two or more.

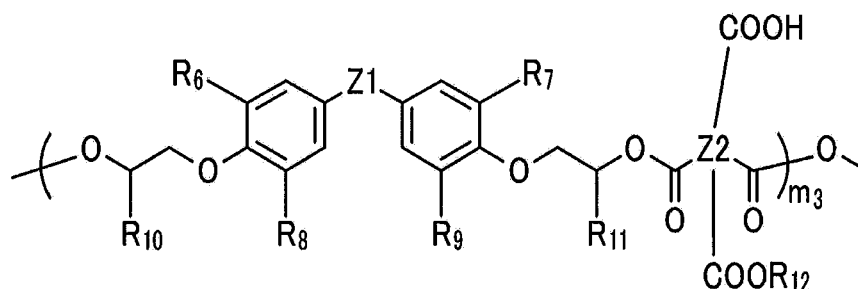
15 In particular, the third dispersing agent may include DISPERBYK® 161, DISPERBYK®163, and DISPERBYK®164 made by BYK Co, EFKA 4046 and EFKA 4047 made by EFKA, SOLSPERSE 24000 made by Lubrizol Co., and the like.

 The third dispersing agent can be selectively used if necessary. It may
20 be used in an amount of 4 parts by weight or less based on 100 parts by weight of a pigment. In another embodiment, it may be included in an amount ranging from 1 to 4 parts by weight. When it is used within the range, the prepared composition may have excellent dispersion stability and development.

[C] Binder resin

The binder resin may be a cardo-based binder resin represented by the following Formula 2.

[Chemical Formula 2]



5 In the above Formula 2,

R_6 to R_9 are the same or different, and are independently selected from the group consisting of hydrogen, a halogen, and a substituted or unsubstituted alkyl,

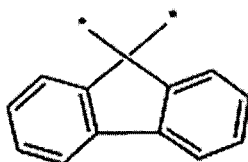
R_{10} and R_{11} are the same or different, and are independently $\text{CH}_2\text{OR}_{13}$ where R_{13} is an acryl, a vinyl, or a methacryl,

R_{12} is selected from the group consisting of hydrogen, an alkyl, an acryl, a vinyl and a methacryl,

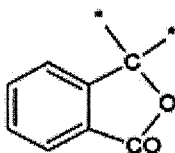
Z_1 is selected from the group consisting of CO, SO_2 , $\text{CR}_{14}\text{R}_{15}$, and $\text{SiR}_{16}\text{R}_{17}$, wherein R_{14} to R_{17} are the same or different, and are independently selected from the group consisting of hydrogen, a fluoroalkyl, and an alkyl, O, a single bond, and one represented by the following Formulae 4 to 14,

Z_2 is a moiety derived from acid anhydride or acid dianhydride, and m_3 is an integer ranging from 1 to 40.

[Chemical Formula 4]

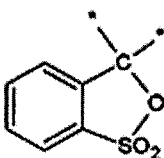


[Chemical Formula 5]

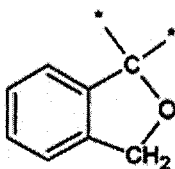


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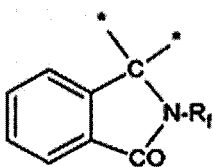
[Chemical Formula 6]



[Chemical Formula 7]



[Chemical Formula 8]

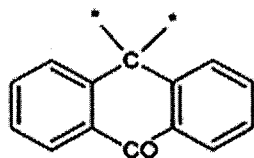


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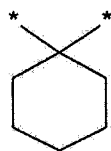
In above Formula 8,

R_f is selected from the group consisting of hydrogen, an ethyl, C_2H_4Cl , C_2H_4OH , $CH_2CH=CH_2$, and a phenyl.

[Chemical Formula 9]

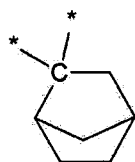


[Chemical Formula 10]

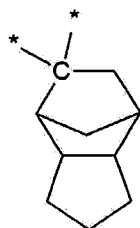


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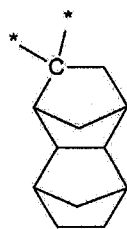
[Chemical Formula 11]



[Chemical Formula 12]

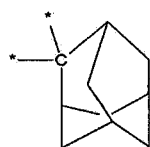


[Chemical Formula 13]



10

[Chemical Formula 14]



For the binder resin, the cardo-based binder resin may be used

singularly or with an acryl-based resin.

Specific examples of the acryl-based binder resin used with the cardo-based binder resin include an acrylate-based copolymer resin obtained from monomers of acrylic acid, methacrylic acid, methylmethacrylate, ethylmethacrylate, propylmethacrylate, ethylhexylmethacrylate, phenylmethacrylate, benzylmethacrylate, tolylmethacrylate, o-silylmethacrylate, glycerolmethacrylate, alkyl arylmethacrylate, succinic methacrylate, and the like. The monomers may be used singularly or in mixture.

The cardo-based binder resin of the above Formula 2 and acryl-based binder resin may be used at a weight ratio of 100:0 to 0:100.

The binder resin is included in an amount of 1 to 50 parts by weight, and preferably 6 to 50 parts by weight based on 100 parts by weight of the pigment. Within the above range, effective dispersion may be obtained, thereby improving physical, optical, and chemical characteristics of the resultant products.

[D] Solvent

The solvent is not specifically limited, and a generally-used solvent may be used singularly or in combination as needed. For example, the solvent may be alcohols such as methanol, ethanol, and so on; ethers such as dichloroethyl ether, n-butyl ether, diisoamyl ether, methylphenyl ether, tetrahydrofuran, and so on; glycol ethers such as ethylene glycol monomethylether, ethylene glycol monoethylether, and so on; cellosolve acetates such as methyl cellosolve acetate, ethyl cellosolve acetate, diethyl cellosolve acetate, and so on; carbitols such as methylethyl carbitol, diethyl carbitol, diethylene glycol monomethylether, diethylene glycol monoethylether, diethylene glycol dimethylether, diethylene

glycol methylethylether, diethylene glycol diethylether, and so on; propylene glycol alkylether acetates such as propylene glycol methylethyl acetate, propylene glycol methylether acetate, propylene glycol propylether acetate, and so on; aromatic hydrocarbons such as toluene, xylene, and so on; ketones such as methylethylketone, cyclohexanone, 4-hydroxy-4-methyl-2-pentanone, methyl-n-propylketone, methyl-n-butylketone, methyl-n-amylketone, 2-heptanone, and so on; saturated aliphatic monocarboxylic acid alkyl esters such as ethyl acetate, n-butyl acetate, isobutyl acetate, and so on; lactic acid esters such as methyl lactate, ethyl lactate, and so on; oxyacetate alkyl esters such as methyl oxyacetate, ethyl oxyacetate, butyl oxyacetate, and so on; alkoxy alkyl acetate esters such as methoxy methyl acetate, methoxy ethyl acetate, methoxy butyl acetate, ethoxy methyl acetate, ethoxy ethyl acetate, and so on; 3-oxy propionic acid alkyl esters such as 3-oxy methyl propionate, 3-oxy ethyl propionate, and so on; 3-alkoxy propionic acid alkyl esters such as 3-methoxy methyl propionate, 3-methoxy ethyl propionate, 3-ethoxy ethyl propionate, 3-ethoxy methyl propionate, and so on; 2-oxy propionic acid alkyl esters such as 2-oxy methyl propionate, 2-oxy ethyl propionate, 2-oxy propyl propionate, and so on; 2-alkoxy propionic acid alkyl esters such as 2-methoxy methyl propionate, 2-methoxy ethyl propionate, 2-ethoxy ethyl propionate, 2-ethoxy methyl propionate, and so on; 2-oxy-2-methyl propionic acid esters such as 2-oxy-2-methyl methyl propionate, 2-oxy-2-methyl ethyl propionate, and so on; monooxy monocarboxylic acid alkyl esters of a 2-alkoxy-2-methyl propionic acid alkyl such as 2-methoxy-2-methyl methyl propionate, 2-ethoxy-2-methyl ethyl propionate, and so on; esters such as 2-hydroxy ethyl propionate,

2-hydroxy-2-methyl ethyl propionate, hydroxy ethyl acetate, and 2-hydroxy-3-methyl methyl butanoate; or ketonic acid esters such as ethyl pyruvate. Furthermore, the solvent may be N-methylformamide, N,N-dimethyl formamide, N-methylformanilide, N-methylacetamide, N,N-dimethyl acetamide, 5 N-methylpyrrolidone, dimethylsulfoxide, benzylethylether, dihexylether, acetonyl acetone, isophorone, caproic acid, caprylic acid, 1-octanol, 1-nonanol, benzylalcohol, benzyl acetate, ethyl benzoate, diethyl oxalate, diethyl maleate, γ-butyrolactone, ethylene carbonate, propylene carbonate, phenyl cellosolve acetate, and so on.

10 Of the above solvents, glycol ethers such as ethylene glycol monoethyl ether; cellosolve acetates such as ethyl cellosolve acetate; esters such as 2-hydroxy ethyl propionate; carbitols such as diethylene glycol monomethyl ether; and propylene glycol alkylether acetates such as propylene glycol methylether acetate, propylene glycol propylether acetate, and so on may be 15 appropriate in terms of compatibility and reactivity.

The solvent may be used in an amount of 10 to 1000 parts by weight and preferably 20 to 500 parts by weight based on 100 parts by weight of the pigment. Within the above range, appropriate viscosity may be obtained, thereby improving physical and optical characteristics of the resultant products.

20 **[E] Other additive**

A pigment dispersion composition of the present invention may further include a color derivative.

The color derivative indicates a pigment derivative or a dye derivative combined with a substituent selected from the group consisting of a sulfone, an

amine, a triazine, and a combination thereof into a pigment or a dye including a pigment ([A] component); a pigment derivative combined with a dye substituent; or a pigment derivative prepared by combining dye substituent with a substituent selected from the group consisting of a sulfone, an amine, a triazine, and a
5 combination thereof.

In particular, the color derivative is prepared by substituting sulfonic acidamine salt, sulfonic acidsodium salt, sulfoneimide, quaternary amine salt, an alkylamine, a triazine derivative, and the like in a naphthalene-based, anthraquinone-based, phthalocyanine-based, diketopyrrolopyrrol-based,
10 azo-based, dioxazine-based, or isoindoline-based pigment or dye.

The color derivative is included in an amount of 1 to 10 parts by weight based on 100 parts by weight of a pigment. When it is included in an amount of less than 1 part by weight, it might be finely dispersed, while when it is included in an amount of more than 10 parts by weight, it may increase viscosity and
15 decrease development.

According to another embodiment of the present invention, provided is a resist composition for a color filter prepared by using the pigment dispersion composition.

The resist composition for a color filter may include a pigment dispersion
20 composition, an alkali soluble resin, a photopolymerization monomer, a photopolymerization initiator, and a solvent.

The pigment dispersion composition may be the same as
aforementioned.

The alkali soluble resin is a carboxyl-included acryl-based binder resin,

and a copolymer of an ethylenic unsaturated monomer including at least one carboxyl group and another ethylenic unsaturated monomer copolymerizable with the ethylenic unsaturated monomer.

The carboxyl-included ethylenic unsaturated monomer is included in an amount of 10 to 40 wt%, and preferably 20 to 30 wt%, based on the total weight of the copolymer.

The carboxyl-included acryl-based binder resin has a molecular weight (Mw) of 10,000 to 70,000, and preferably 20,000 to 50,000.

The carboxyl-included ethylenic unsaturated monomer includes acrylic acid, methacrylic acid, maleic acid, itaconic acid, fumaric acid, succinic acid, and the like, and the alkali soluble resin include at least one monomer described above.

Examples of the another ethylenic unsaturated monomer copolymerizable with the carboxyl-included ethylenic unsaturated monomer include styrenes such as styrene, α -methyl styrene, and the like; unsaturated carbonic acid esters such as vinyltoluene; vinyl benzyl methyl ether, methyl acrylate, methyl methacrylate, ethyl acrylate, ethyl methacrylate, butyl acrylate, butyl methacrylate, 2-hydroxy ethyl acrylate, 2-hydroxy ethyl methacrylate, 2-hydroxy butyl acrylate, 2-hydroxy butyl methacrylate, benzyl acrylate, benzyl methacrylate, cyclo hexyl acrylate, cyclo hexyl methacrylate, phenyl acrylate, phenyl methacrylate, and the like; unsaturated carbonic acid amino alkyl esters such as 2-amino ethyl acrylate, 2-amino ethyl methacrylate, 2-dimethyl amino ethyl acrylate, 2-dimethyl amino ethyl methacrylate, and the like; carbonic acid vinyl esters such as vinyl acetate, vinyl benzoate, and the like; unsaturated

carbonic acid glycidyl esters such as glycidyl acrylate, glycidyl methacrylate, and the like; vinyl cyanide compounds such as acrylonitrile, methacrylonitrile, and the like; and unsaturated amides such as acryl amide, methacryl amide, and the like. The alkali soluble resin is obtained from at least one monomer described above.

5 Specific examples of the alkali soluble resin obtained from the monomers include, are not limited to, a methacrylic acid/methyl methacrylate copolymer, a methacrylic acid/benzyl methacrylate copolymer, a methacrylic acid/benzylmethacrylate/styrene copolymer, a methacrylic acid/benzylmethacrylate/2-hydroxy ethyl methacrylate copolymer, and a
10 methacrylic acid/benzylmethacrylate/styrene/2-hydroxy ethyl methacrylate copolymer.

The alkali soluble resin is included is included in an amount of 0.5 to 20 wt% based on the total weight of the color filter resist composition. When the alkali soluble resin is included within the range, the composition has an
15 advantage of excellent cross-linking and development, being developed in an alkali development solution.

The alkali soluble resin is one of the most influential factors on resolution of pixels in the present invention. For example, when the alkali soluble resin is a methacrylic acid/benzyl methacrylate copolymer, it may result in a remarkable
20 resolution difference of pixels depending on their acid value and molecular weight. For example, when the methacrylic acid and benzyl methacrylate are included in an amount ratio of 25mol%:75mol%, an acid value ranging from 80 to 120 KOHmg/g, and a molecular weight ranging from 10,000 to 40,000, the pixels can have the best resolution.

The photopolymerization monomer may include a multi-functional monomer including at least two hydroxys. The photopolymerization monomer includes dipentaerythritol hexaacrylate, ethyleneglycol diacrylate, triethyleneglycol diacrylate, 1,4-butanediol diacrylate, 1,6-hexanediol diacrylate, neopentylglycol diacrylate, pentaerythritol diacrylate, pentaerythritol triacrylate, dipentaerythritol diacrylate, dipentaerythritol triacrylate, dipentaerythritol pentaacrylate, pentaerythritol hexaacrylate, bisphenol A diacrylate, trimethylolpropane triacrylate, novolac polyacrylate, ethyleneglycol dimethacrylate, diethyleneglycol dimethacrylate, triethyleneglycol dimethacrylate, propyleneglycol dimethacrylate, 1,4-butanediol dimethacrylate, 1,6-hexanediol dimethacrylate, and the like, but is not limited thereto.

The photopolymerization monomer may be included in an amount of 1 to 20 wt% based on the total amount of the color filter resist composition. When the photopolymerization monomer is included in an amount of less than 1 wt%, it may cause a film to not be sufficiently cured after the pattern formation, decreasing film strength. When it is included in an amount of more than 20 wt%, viscosity of the composition increases, and thereby storage stability is reduced.

The photopolymerization initiator may be a generally-used photopolymerization initiator for a photosensitive resin composition. The photopolymerization initiator includes an acetophenone-based compound, a benzophenone-based compound, a thioxanthone-based compound, a benzoin-based compound, a triazine-based compound, and the like.

The triazine-based compound includes a compound selected from the

group consisting of 2,4,6-trichloro-s-triazine,
 2-phenyl-4,6-bis(trichloromethyl)-s-triazine,
 2-(3',4'-dimethoxystyryl)-4,6-bis(trichloromethyl)-s-triazine,
 2-(4'-methoxynaphthyl)-4,6-bis(trichloromethyl)-s-triazine,
 5 2-(p-methoxyphenyl)-4,6-bis(trichloromethyl)-s-triazine,
 2-(p-tolyl)-4,6-bis(trichloromethyl)-s-triazine, 2-biphenyl-4,6-bis(trichloro
 methyl)-s-triazine, bis(trichloromethyl)-6-styryl-s-triazine, 2-(naphto
 1-yl)-4,6-bis(trichloro methyl)-s-triazine, 2-(4-methoxy naphto
 1-yl)-4,6-bis(trichloro methyl)-s-triazine, 2-4-trichloro methyl(piperonyl)-6-triazine,
 10 2-4-trichloromethyl (4'-methoxy styryl)-6-triazine, and combinations thereof.

The acetophenone-based compound includes
 2,2'-diethoxyacetophenone, 2,2'-dibutoxyacetophenone, 2-hydroxy-2-methyl
 propiophenone, p-t-butyltrichloroacetophenone, p-t-butyldichloroacetophenone,
 4-chloroacetophenone, 2,2'-dichloro-4-phenoxyacetophenone, 2-methyl-1-
 15 (4-(methylthio)phenyl)-2-morpholinopropan-1-one, 2-benzyl-2-dimethylamino-1-
 (4-morpholinophenyl)-butan-1-one, and combinations thereof.

The benzophenone-based compound includes benzophenone, benzoyl
 benzoate, benzoyl methyl benzoate, 4-phenyl benzophenone, hydroxy
 benzophenone, acrylated benzophenone, 4,4'-bis(dimethyl
 20 amino)benzophenone, 4,4'-bis(diethylamino) benzophenone,
 4,4'-dimethylamino benzophenone, 4,4'-dichloro benzophenone,
 3,3'-dimethyl-2-methoxy benzophenone, and combinations thereof.

The thioxanthone-based compound includes thioxanthone,
 2-methylthioxanthone, isopropyl thioxanthone, 2,4-diethyl thioxanthone,

2,4-diisopropyl thioxanthone, 2-chlorothioxanthone, and combinations thereof.

The benzoin-based compound includes benzoin, benzoin methyl ether, benzoin ethyl ether, benzoin isopropyl ether, benzoin isobutyl ether, benzyldimethylketal, and combinations thereof.

- 5 The photopolymerization initiator may include a carbazole-based compound, a diketone-based compound, a sulfonium borate-based compound, a diazo-based compound, a biimidazole-based compound, and the like in addition to the above photopolymerization initiator. Among the photopolymerization initiators, a triazine-based compound may be appropriate.
- 10 Among the triazine-based compounds, preferable is one having the most influence on performance of a pixel pattern at a maximum photo-absorption wavelength (λ max) of 340 to 380nm.

- The photopolymerization initiator may be included in an amount of 0.1 to 10 wt% based on the entire amount of a photosensitive resin composition.
- 15 When it is included within the range, it may facilitate sufficient photopolymerization in the pattern forming process during the exposure. In addition, remaining unreactive initiator after the photopolymerization may deteriorate transmittance.

- The solvent may be the same as the solvent for the pigment dispersion
- 20 composition according to the present invention. The solvent may be used in a balance amount.

Furthermore, the color filter resist composition may further include a cardo-based binder resin.

When the component is included in a resist composition for a color filter,

the composition can be prepared by dissolving a photopolymerization initiator in a solvent and agitating the mixture for 2 hours at room temperature (S1), adding an alkali soluble resin and a photopolymerization monomer thereto and agitating the product at room temperature for 2 hours (S2), and adding a pigment dispersion solution thereto and agitating it for 1 hour (S3), and then filtrating it three times to remove impurities.

In addition, the resist composition for a color filter can be prepared by mixing [A] a pigment, [B] a dispersing agent, [C] a cardo-based binder resin, [D] a solvent, an alkali soluble resin, a photopolymerization monomer, and a photopolymerization initiator rather than separately preparing a pigment dispersion solution.

According to still another embodiment of the present invention, provided is a color filter prepared by using a resist composition for a color filter prepared by the pigment dispersion composition.

The color filter may be fabricated by a method including: coating the pigment dispersion composition on a wafer for a color filter in a thickness of between 5000 and 8000 Å in accordance with a coating process such as spin coating, slit coating, and so on; irradiating the coated pigment dispersion composition layer to obtain a required pattern for the color filter; and treating the coating layer with an alkali developing solution to dissolve a non-exposed part of the coating layer and to provide a color filter having a required pattern. The light source for the irradiation may include 356nm I-line light, but is not limited thereto.

The process may be repeated depending upon the required number of

colors of red (R), green (G), and blue (B), so as to provide a color filter having a desired pattern. During the fabricating process, the image pattern obtained after the development step may be hardened by reheating or irradiating with an actinic ray to improve crack-resistance, solvent-resistance, and so on.

5 It is thereby possible to provide a color filter having a fine pixel of a micro-square pattern. Thereby, the color filter fabricated by using the resist composition for a color filter can show a high resolution when it is applied to an image sensor.

【Mode for Invention】

10 Hereinafter, the present invention is illustrated in more detail with reference to examples. However, they are exemplary embodiments of present invention and are not limiting.

1. Preparation of a pigment dispersion composition

Example 1

15 A pigment dispersion composition was prepared to have the following composition by using a bead mill for 3 hours for dispersion.

C. I. Pigment Red 254 15 parts by weight

(Ciba Specialty Chemicals, Irgaphor Red BT-CF)

5 parts by weight of LP-21357 (dispersing agent of Chemical Formula 1)

20 (BYK Co.)

2 parts by weight of Disperbyk111 (a dispersing agent of Chemical Formula 3) (BYK Co.)

5 parts by weight of V259ME (a cardo-based resin of Chemical Formula 2) (Nippon Steel Chemical Co.)

55 parts by weight of propylene glycol methylethylacetate

Example 2

A pigment dispersion composition was prepared according to the same method as in Example 1, except for not using 2 parts by weight of Disperbyk111

5 (BYK Co).

Comparative Example 1

A pigment dispersion composition was prepared under the same conditions as in Example 1, except for changing the composition as follows.

C. I. Pigment Red 254 15 parts by weight

10 (Ciba Specialty Chemicals, Irgaphor Red BT-CF)

5 parts by weight of LP-21357 (a dispersing agent included in Chemical Formula 1) (BYK Co.)

2 parts by weight of Disperbyk111 (a dispersing agent included in Chemical Formula 3) (BYK Co.)

15 5 parts by weight of an acrylic acid benzylmethacrylate copolymer (Miwon Commercial Co., Ltd., NPR8000)

55 parts by weight of propyleneglycol methylethylacetate

Comparative Example 2

20 A pigment dispersion composition was prepared under the same conditions as in Example, 1 except for changing the composition as follows.

15 parts by weight of C. I. Pigment Red 254

(Ciba Specialty Chemicals, Irgaphor Red BT-CF)

5 parts by weight of a polyimine-based dispersing agent

(EFKA Inc., EFKA4046)

5 parts by weight of an acrylic acid benzylmethacrylate copolymer
(Miwon Commercial Co., Ltd., NPR8000)

55 parts by weight of propylene glycol methylethylacetate

2. Primary average particle diameter of a pigment

5 The pigment dispersion compositions of Examples 1 and 2 and Comparative Examples 1 and 2 were measured regarding average particle diameter (dispersion particle size) by using a light-scattering particle size analyzer (Horiba Ltd., LB-500) and regarding viscosity by using a viscosity analyzer (Brookfield Co. - DVIII Ultra). The results are provided in the
10 following Table 1.

[Table 1]

Pigment dispersion composition	Example 1	Example 2	Comparative Example 1	Comparative Example 2
Average particle diameter of pigment (nm)	60	65	70	90
Viscosity (cP)	5	6.5	10	7

Referring to Table 1, the pigment dispersion compositions of Examples 1 and 2 included remarkably fine pigment particles compared with the ones of Comparative Examples 1 and 2, but viscosity thereof was not increased.
15 Accordingly, the pigment dispersion compositions of Examples 1 and 2 turned out to have excellent dispersion stability.

3. Preparation of a color resist composition

Example 3

The pigment dispersion composition of Example 1 was used to prepare a color resist composition with the following composition through agitating processes by using a formulator for one hour.

- 5 50 parts by weight of the pigment dispersion composition of Example 1
- 4 parts by weight of an acrylic acid benzylmethacrylate copolymer
(Miwon commercial Co., Ltd. NPR8000)
- 4 parts by weight of a photopolymerization monomer
(Dongyang SYN Co., Ltd., DPHA)
- 10 41.5 parts by weight of propyleneglycol methylethylacetate
- 0.5 parts by weight of a triazine-based photopolymerization initiator
(Nippon Kayaku Co., Ltd., TPP)

Example 4

- A resist composition for a color filter was prepared according to the same
- 15 method as Example 3, except for using the pigment dispersion composition of
Example 2.

Comparative Example 3

- A resist composition for a color filter was prepared according to the same
- method as Example 2, except for using the pigment dispersion composition of
- 20 Comparative Example 1.

Comparative Example 4

A color resist composition was prepared according to the same method
as Example 2, except for using the pigment dispersion composition of
Comparative Example 2.

4. Scanning electron microscope (SEM) analysis of patterns for a color filter

The resist compositions for a color filter of Examples 3 and 4 and Comparative Examples 3 and 4 were coated to be 0.8 μ m thick on a silicon wafer (LG Siltron Inc.) by using a spin coater (KDNS Co., Ltd., K-Spin8), and then exposed to light for 200ms by using an exposers (Nikon Co., I10C) and developed with a development solution (TMAH: tetramethyl ammonium hydroxide) to form a pattern. The pattern was examined regarding resolution and residue with a CD SEM analyzer (KLA-Tencor Co., 8100XP).

FIGs. 1 to 4 respectively show resolution of the patterns prepared by coating the resist compositions for a color filter according to Examples 3 and 4 and Comparative Examples 3 and 4 and then exposing them to light and developing them.

Referring to FIGs. 1 to 4, the patterns of Examples 3 and 4 in FIGs. 1 and 2 had remarkably excellent resolution forming a square compared with the ones of Comparative Examples 3 and 4 in FIGs. 3 and 4. In addition, FIGs. 3 and 4 show a great deal of residue compared with the FIGs. 1 and 2.

Therefore, when a pattern was formed by using a pigment dispersion composition a first dispersing agent of Chemical Formula 1 and a cardo-based binder resin of Chemical Formula 2 according to the present invention, it can improve resolution but decreases residue of an image.

While this invention has been described in connection with what is presently considered to be practical exemplary embodiments, it is to be understood that the invention is not limited to the disclosed embodiments, but,

on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

【CLAIMS】**【Claim 1】**

A pigment dispersion composition comprising:

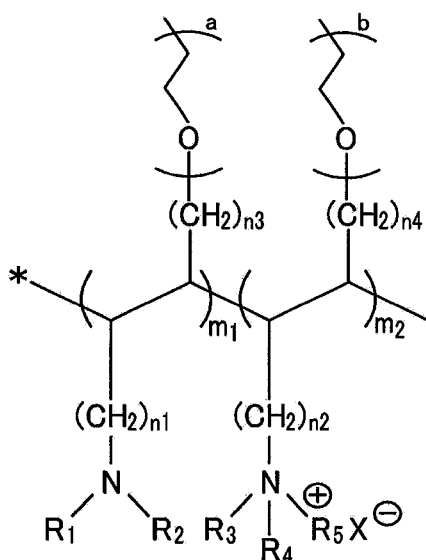
[A] a pigment;

5 [B] a dispersing agent of the following Formula 1;

[C] a cardo-based binder resin of the following Formula 2; and

[D] a solvent

[Chemical Formula 1]



10 wherein, in the above Formula 1,

R_1 to R_5 are the same or different, and are independently selected from the group consisting of hydrogen, a substituted or unsubstituted alkyl, a substituted or unsubstituted alkenyl, a substituted or unsubstituted alkynyl, a substituted or unsubstituted aryl, a substituted or unsubstituted heteroaryl, a substituted or unsubstituted arylalkyl, a substituted or unsubstituted cycloalkyl, a substituted or unsubstituted heterocycloalkyl, a substituted or unsubstituted

cycloalkenyl, a substituted or unsubstituted cycloalkynyl, a substituted or unsubstituted alkoxy, a substituted or unsubstituted alkyl amino, a substituted or unsubstituted alkoxy amino, and a substituted or unsubstituted alkanol,

X is selected from the group consisting of a halogen, a sulfone, an alkylsulfone, and a hydroxy,

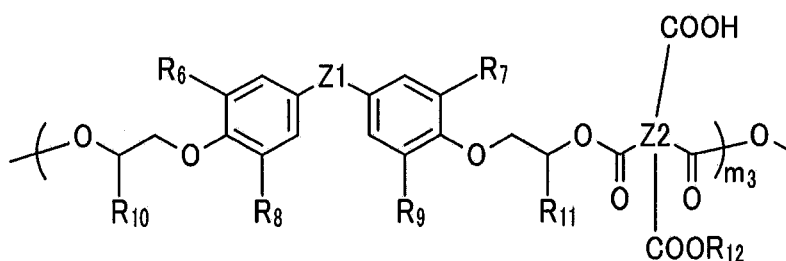
m_1 ranges from 30 to 100mol%,

m_2 ranges from 0 to 70mol%,

n_1 to n_4 are the same or different, and are independently integers ranging from 1 to 20, and

a and b are the same or different, and are independently integers ranging from 0 to 18,

[Chemical Formula 2]



wherein, in the above Formula 2,

R₆ to R₉ are the same or different, and are independently selected from the group consisting of hydrogen, a halogen atom, and a substituted or unsubstituted alkyl,

R₁₀ and R₁₁ are the same or different, and are independently CH₂OR₁₃ (R₁₃ is an acryl, a vinyl, or a methacryl),

R₁₂ is selected from the group consisting of hydrogen, an alkyl, an acryl,

a vinyl, and a methacryl,

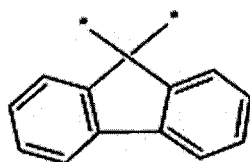
Z_1 is selected from the group consisting of CO, SO₂, CR₁₄R₁₅, SiR₁₆R₁₇ (wherein, R₁₄ to R₁₇ are the same or different, and are independently selected from the group consisting of hydrogen, a fluoroalkyl, and an alkyl), O, a single

5 bond, and the following Formulae 4 to 14,

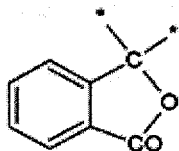
Z_2 is a moiety derived from acid anhydride or acid dianhydride, and

m_3 is an integer ranging from 1 to 40,

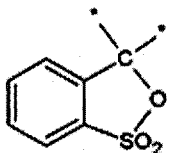
[Chemical Formula 4]



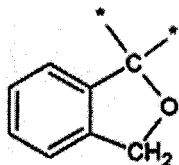
10 [Chemical Formula 5]



[Chemical Formula 6]

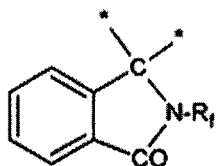


[Chemical Formula 7]



15

[Chemical Formula 8]

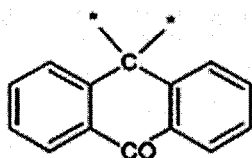


wherein, the above Formula 8,

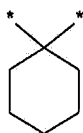
R_f is selected from the group consisting of hydrogen, an ethyl, C₂H₄Cl,

5 C₂H₄OH, CH₂CH=CH₂, and a phenyl,

[Chemical Formula 9]

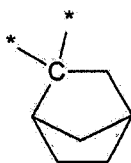


[Chemical Formula 10]

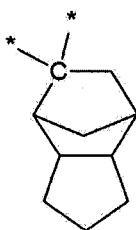


10

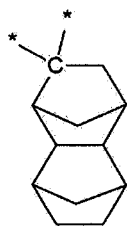
[Chemical Formula 11]



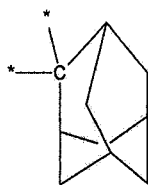
[Chemical Formula 12]



[Chemical Formula 13]



[Chemical Formula 14]



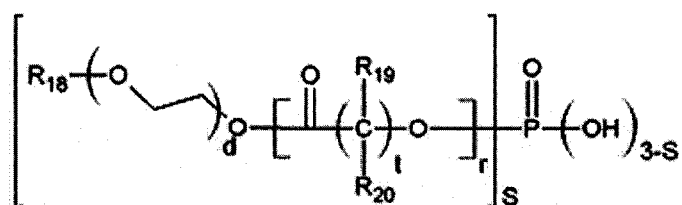
5

[Claim 2]

The pigment dispersion composition of claim 1, wherein the dispersing agent comprises a first dispersing agent represented by the above Formula 1 and a second dispersing agent represented by the following Formula 3:

10

[Chemical Formula 3]



wherein, the above Formula 3,

R_{18} and R_{20} are the same or different, and are independently selected from the group consisting of hydrogen, a substituted or unsubstituted alkyl, a substituted or unsubstituted alkenyl, a substituted or unsubstituted alkynyl, a substituted or unsubstituted aryl, a substituted or unsubstituted heteroaryl, a substituted or unsubstituted arylalkyl, a substituted or unsubstituted cycloalkyl, a

substituted or unsubstituted heterocycloalkyl, a substituted or unsubstituted cycloalkenyl, a substituted or unsubstituted cycloalkynyl, a substituted or unsubstituted alkoxy, a substituted or unsubstituted alkyl amino, a substituted or unsubstituted alkoxy amino, and a substituted or unsubstituted alkanol,

- 5 d is an integer ranging from 0 to 20,
 t is an integer ranging from 1 to 20,
 r is an integer ranging from 1 to 40, and
 s is an integer ranging from 1 to 2.

10 **【Claim 3】**

The pigment dispersion composition of claim 2, wherein the first dispersing agent and the second dispersing agent are mixed in a weight ratio ranging from 99:1 to 50:50.

15 **【Claim 4】**

The pigment dispersion composition of claim 1, wherein the composition comprises 1 to 50 parts by weight of the cardo-based binder resin, 10 to 1000 parts by weight of the solvent, and 10 to 80 parts by weight of the dispersing agent based on 100 parts by weight of the pigment.

20

【Claim 5】

The pigment dispersion composition of claim 1, wherein the composition comprises one or more third dispersing agents selected from the group

consisting of a polycarbonic acid ester, an unsaturated polyamide, a polycarbonic acid, polycarbonic acid, an alkyl amine, a polyacryl, a polyethyleneimine, a polyurethane, a polyether, an acryl resin, phosphoric acidester, and a modified urethane.

5

【Claim 6】

The pigment dispersion composition of claim 1, wherein the pigment has an average particle diameter ranging from 30 to 100nm.

10 **【Claim 7】**

The pigment dispersion composition of claim 1, wherein the pigment is more than one selected from the group consisting of red dipyrrolopyrrol pigment, red anthraquinone pigment, copper phthalocyanine pigment replaced with green halogen, blue copper phthalocyanine pigment, yellow isoindoline pigment, 15 yellow quinophthalone pigment, and yellow nickel complex pigment.

【Claim 8】

The pigment dispersion composition of claim 1, wherein the composition comprises 1 to 10 parts by weight of a color derivative pigment based on 100 20 parts by weight of the pigment.

【Claim 9】

The pigment dispersion composition of claim 8, wherein the color

derivative is a naphthalene-based, anthraquinone-based, phthalocyanine-based, diketopyrrolopyrrol-based, azo-based, dioxazine-based, or isoindoline-based pigment or dye replaced with a substituent selected from the group consisting of a sulfonic acidamine salt, a sulfonic acidsodium salt, a sulfoneimide, a
5 quaternary amine salt, an alkylamine, a triazine derivative, and a combination thereof.

【Claim 10】

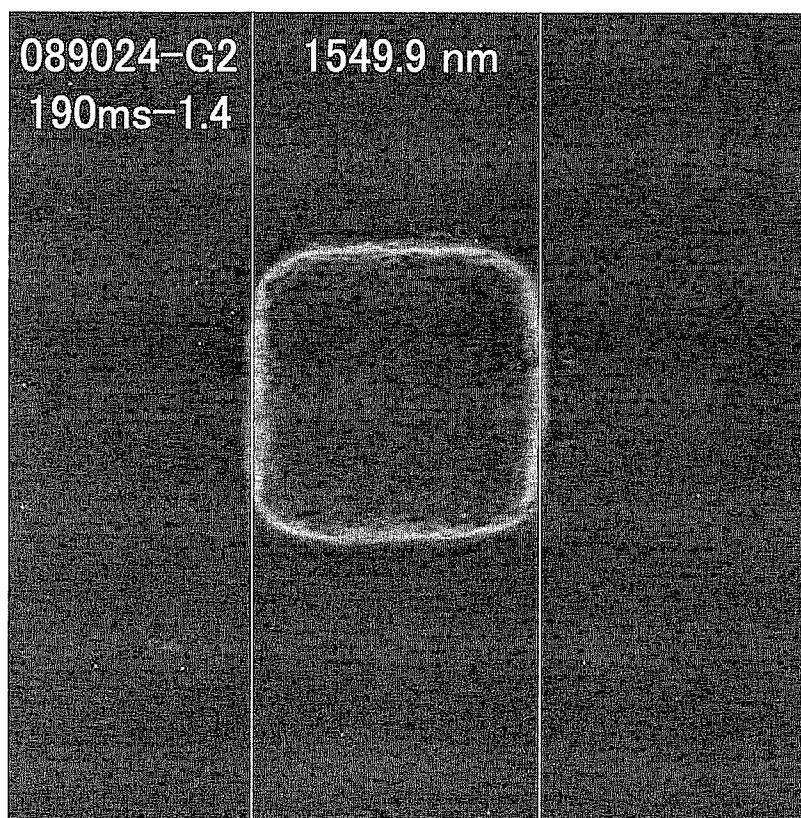
A resist composition for a color filter comprising the pigment dispersion
10 composition according to one of claims 1 to 9.

【Claim 11】

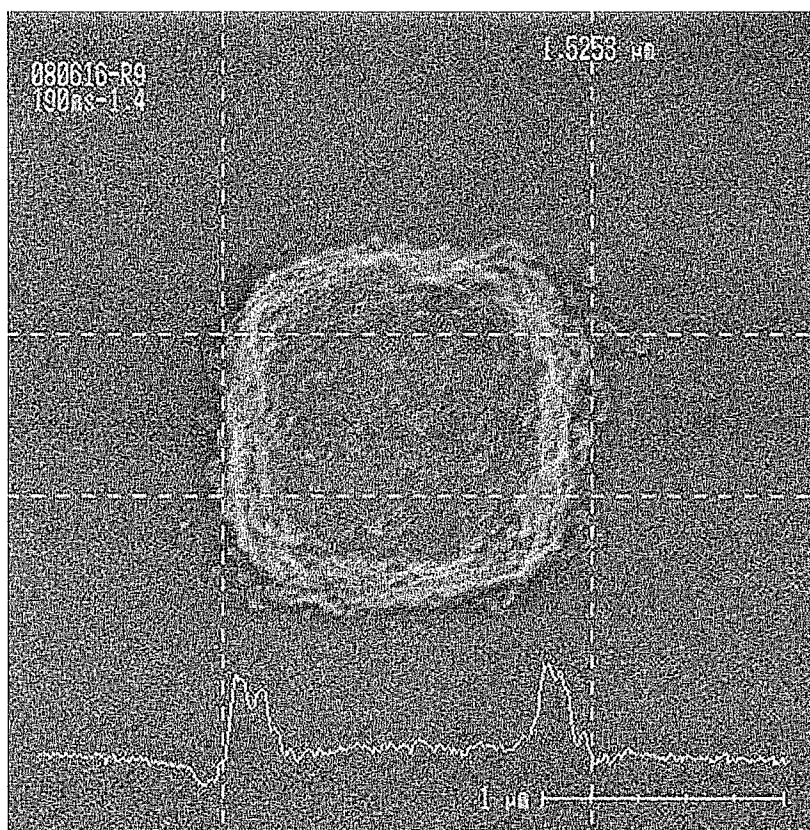
A color filter fabricated by using the resist composition of claim 10.

【DRAWINGS】

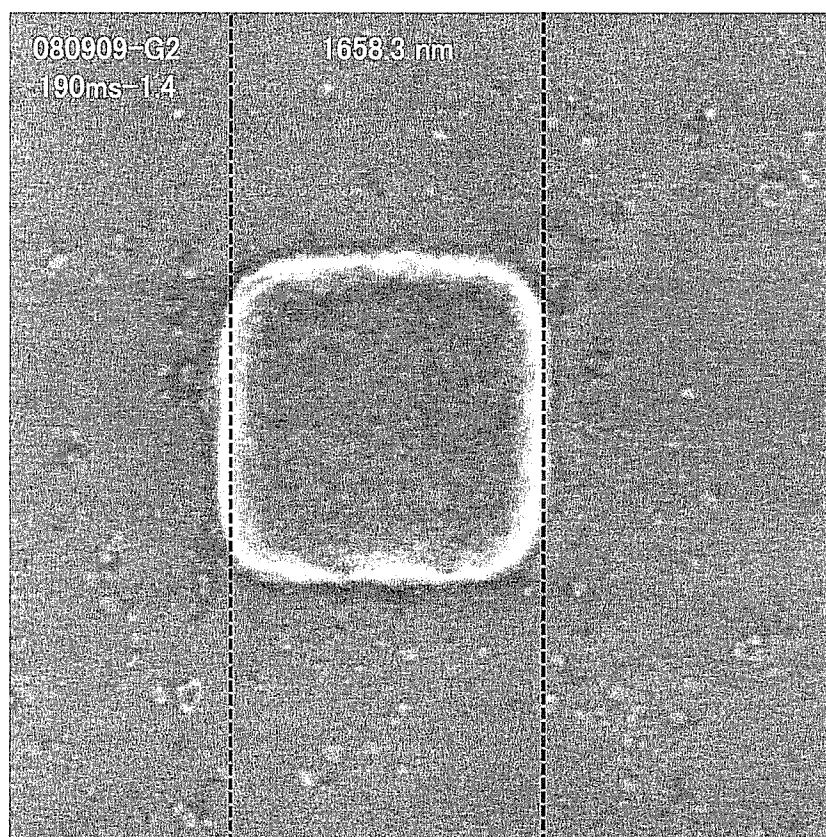
【FIG. 1】



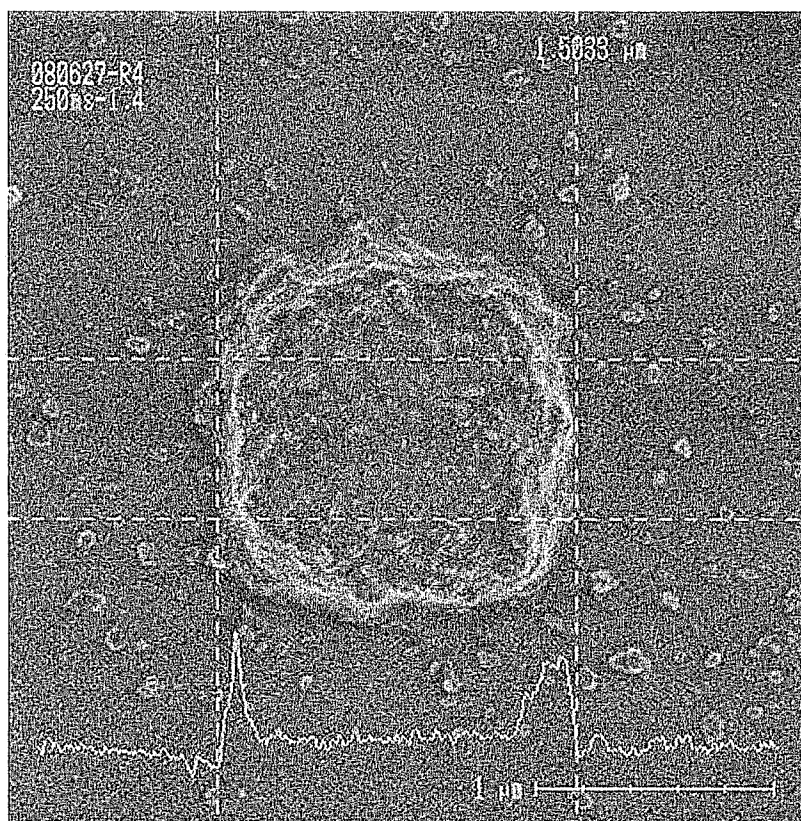
【FIG. 2】



【FIG. 3】



【FIG. 4】



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2008/007890**A. CLASSIFICATION OF SUBJECT MATTER****C09B 67/46(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 8 C09B 67/46, C09B 67/22, C09B 67/02, G02B 5/20

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Utility models and applications for Utility models since 1975

Japanese Utility models and applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO Internal)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR10-2007-115762 A (NIPPON STEEL CHEMICAL CO., LTD.) 06 DECEMBER 2007 See claims 1~10; <75>~<80>.	1~11
A	JP2000-160084 A (NIPPON STEEL CHEMICAL CO., LTD.) 13 JUNE 2000 See claims 1~5; [0039]~[0045].	1~11
A	KR10-2008-055111 A (CHEIL INDUSTRIES INC.) 19 JUNE 2008 See claims 1~12; <28>~<60>.	1~11
A	KR10-2007-116183 A (MITSUBISHI CHEMICAL CORPORATION) 06 DECEMBER 2007 See claims 1~8.	1~11

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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"&" document member of the same patent family

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31 AUGUST 2009 (31.08.2009)

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

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