composition preferably exhibits photosensitivity and has a photolithography performance enabling patterning by exposure. The light-blocking photosensitive composition having a photolithography performance includes a black resist using carbon black employed for the formation of an LCD color filter. The carbon black has a high light-blocking effect in the visible region but exhibits a low light-blocking effect in the infrared region and in the case where such a black resist is applied as a solder resist, if carbon black is added in an amount large enough to ensure the required light-blocking effect in the infrared region, this causes a problem that the light-blocking effect in the visible region becomes excessively high, the exposure light at a shorter wavelength than the visible region, such as high-pressure mercury lamp, KrF and ArF, which is usually used for image formation, is also cut, failing in obtaining sufficient photo-curability, and an excellent pattern cannot be obtained even when passed through a development step using an alkali developer.

Also, at present, an infrared-blocking layer is separately provided after forming a solder resist by a coating method and therefore, in the solder resist formation and the infrared-blocking layer formation, steps such as coating, exposure, development and post-heating must be performed a plurality of times, which leads to a cumbersome process and a rise in the cost. Therefore, improvements are required.

For meeting the requirement, it has been attempted to impart a light-blocking effect to the solder resist itself and, for example, a black solder resist composition containing a black colorant, a colorant other than black, and a polyfunctional epoxy compound have been proposed (see, for example, JP-A-2008-257045). However, this composition is characterized in that the content of the black colorant is kept low by using a colorant other than black in combination, and is practically insufficient in terms of satisfying both light-blocking effect, particularly light-blocking effect in the infrared region, and pattern formability.

Summary ~~of Invention~~

For the purpose of detecting the position of a semiconductor substrate by a visible light sensor in the process of producing a solid-state imaging device, an alignment mark in a protruded form is often provided at the predetermined position in the surface on the metal wiring and solder resist side (that is, the surface opposite the color filter or lens) of a semiconductor substrate of a solid-state imaging device.

In the case of the above-described configuration where an infrared-blocking layer is further provided on the outer side of the solder resist lacking the light-blocking effect for

infrared light, it is considered that even when the infrared-blocking layer is a layer having a light-blocking effect also for visible light, the thickness of this layer need not be so large for the infrared-blocking purpose (because, the infrared-blocking purpose can be achieved with a thinner film than the solder resist layer) and therefore, the detection by a visible light sensor is not caused to face a serious trouble by the covering of the alignment mark with the infrared-blocking layer. However, particularly in the configuration where, as in JP-A-2008-257045, a black colorant is contained in the solder resist composition for imparting a light-blocking effect to the solder resist itself, when the alignment mark is covered by a solder resist layer, maybe due to the thickness of the solder resist layer, a trouble that the alignment mark is not detected by a visible light sensor is liable to more often occur.

Under these circumstances, a polymerizable composition ensuring excellent durability to high temperature/high humidity, high light-blocking effect in the infrared region, high light transparency in the visible region, and capability of forming an excellent pattern by alkali development is demanded at present.

Incidentally, JP-A-2009-205029 discloses a technique of using an inorganic near infrared absorber-containing layer as a near infrared-absorbing layer for an image display device and, for example, a coating solution for near infrared-absorbing layer formation, containing a polymerizable compound, a polymerization initiator and a near infrared absorber, is described in working examples, but the layer obtained from this coating solution is not subjected to pattern formation through exposure and alkali development. Actually, this layer is, even in the unexposed region, insufficient in solubility for an alkali developer and has substantially no alkali developability.

The present invention has been made by taking into consideration these current circumstances, and the task of the present invention is to solve those conventional problems and attain the following object.

That is, an object of the present invention is to provide a polymerizable composition exhibiting high light-blocking effect in the infrared region and high light transparency in the visible region and being capable of forming a pattern with desired profile and excellent durability (for example, durability to high temperature/high humidity, and adherence to substrate) by alkali development.

In one aspect, there is provided a polymerizable composition, comprising:
a polymerization initiator;
a polymerizable compound;
a tungsten compound;
an alkali-soluble binder;
and a filler,
wherein the polymerizable composition has a viscosity at 25° C. of 700 to 1400 mPa·s and the polymerization initiator is an acetophenone-based compound.

In another aspect, there is provided a solder resist comprising a polymerizable composition comprising:
a polymerization initiator;
a polymerizable compound;
a tungsten compound;
an alkali-soluble binder;
and a filler,
wherein the polymerizable composition has a viscosity at 25° C. of 700 to 1400 mPa·s.

In another aspect, there is provided a polymerizable composition comprising:
a polymerization initiator;
a polymerizable compound;
a tungsten compound;
an alkali-soluble binder; and
a filler,
wherein:
the polymerizable composition has a viscosity at 25° C. of 700 to 1400 mPa·s, and
the polymerization initiator is an oxime compound selected from the group consisting of 1,2-octanedione,1-[4-(phenylthio)-, 2-(O-benzoyloxime)] and ethanone, 1-[9-ethyl-6-(2-methylbenzoyl)-9H-carbazol-3-yl]-, 1-(O-acetyloxime).

In another aspect, there is provided a polymerizable composition comprising:
a polymerization initiator;
a polymerizable compound;

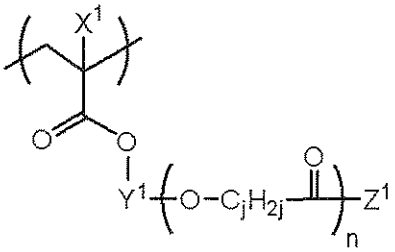
a tungsten compound; an alkali-soluble binder;

a filler; and

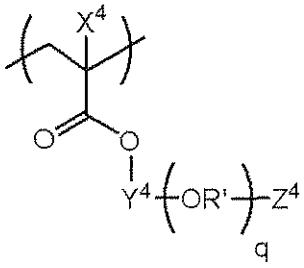
a dispersant,

wherein:

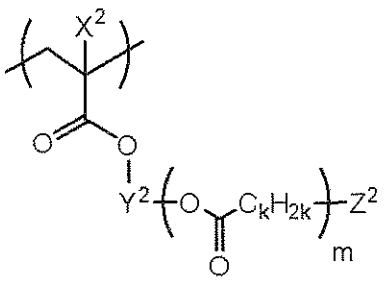
the polymerizable composition has a viscosity at 25° C. of 700 to 1400 mPa·s, and the dispersant has a structural unit represented by any one of formulae (1) to (5):



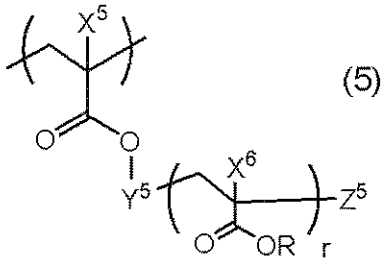
(1)



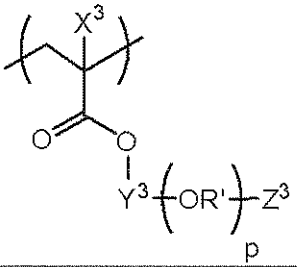
(4)



(2)



(5)



(3)

wherein, in formulae (1) to (5), each of X^1, X^2, X^3, X^4, X^5 and X^6 independently represents a hydrogen atom or a monovalent organic group, each of Y^1, Y^2, Y^3, Y^4 and Y^5 independently represents a divalent linking group, each of Z^1, Z^2, Z^3, Z^4 and Z^5 independently represents a hydrogen atom or a monovalent substituent, each of n, m, p, q and r represents an integer of 1 to 500, in formulae (1) and (2), each of j and k independently represents an integer of 2 to 8, in formulae (3) and (4), R' represents a branched or linear alkylene group, and in formula (5), R represents a hydrogen atom or a monovalent organic group.

In another aspect, there is provided a polymerizable composition comprising:
a polymerization initiator;
a polymerizable compound;
a tungsten compound;
an alkali-soluble binder;
a filler; and
a rubber-modified epoxy resin, wherein the polymerizable composition has a viscosity at 25° C. of 700 to 1400 mPa·s.

In another aspect, there is provided a polymerizable composition comprising:
a polymerization initiator;
a polymerizable compound;
a tungsten compound;
an alkali-soluble binder; and
a filler.
wherein the polymerizable composition has a viscosity at 25° C. of 700 to 1400 mPa·s and the filler is a spherical filler surface-treated with a silane coupling agent.

The present ~~invention~~disclosure also has the following configurations, and the above-described object can be attained by these configurations.

(1) A polymerizable composition, comprising:

a polyfunctional polymerizable compound having a plurality of polymerizable groups within a molecule.

8. The polymerizable composition according to claim 1, wherein the filler includes at least two kinds of fillers having different volume average particle diameters of primary particles.

9. The polymerizable composition according to claim 1, further comprising: a silane coupling agent.

10. A solder resist comprising a polymerizable composition comprising:
a polymerization initiator;
a polymerizable compound;
a tungsten compound;
an alkali-soluble binder;
and a filler,
wherein the polymerizable composition has a viscosity at 25° C. of 700 to 1400 mPa·s.

11. The solder resist according to claim 10, wherein the polymerizable composition has a solid content concentration of from 30 to 80 mass %.

12. The polymerizable composition according to claim 3, wherein the urethane-based resin is a urethane-based resin having, as the basic structure, a structure unit represented by a reaction product between at least one diisocyanate compound represented by formula (1) and at least one diol compound represented by formula (2):

OCN--X--NCO (1)

HO-L^1-OH (2)

wherein in formulae (1) and (2), each of X and L^1 independently represents a divalent organic residue.

13. A polymerizable composition comprising:
a polymerization initiator;
a polymerizable compound;