

631145

FORM 1

SPRUSON & FERGUSON

COMMONWEALTH OF AUSTRALIA
PATENTS ACT 1952
APPLICATION FOR A STANDARD PATENT

Canon Kabushiki Kaisha, incorporated in Japan, of 30-2, 3-chome, Shimomaruko, Ohta-ku, Tokyo, JAPAN, hereby apply for the grant of a standard patent for an invention entitled:

Image Forming Method and Image Forming Medium

which is described in the accompanying complete specification.

Details of basic application(s):-

<u>Basic Applic. No:</u>	<u>Country:</u>	<u>Application Date:</u>
63-250172	JP	4 October 1988
63-250174	JP	4 October 1988
63-250176	JP	4 October 1988
1-130164	JP	25 May 1989
1-182033	JP	13 July 1989

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DATED this FOURTH day of OCTOBER 1989

Canon Kabushiki Kaisha

By:



Registered Patent Attorney

TO: THE COMMISSIONER OF PATENTS
OUR REF: 108964
S&F CODE: 59510

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COMMONWEALTH OF AUSTRALIA
THE PATENTS ACT 1952
DECLARATION IN SUPPORT OF A
CONVENTION APPLICATION FOR A PATENT

In support of the Convention Application made for a
patent for an invention entitled: Image Forming Method and
Image Forming Medium

CFO-6401-AU

Spruson & Ferguson

Title of Invention

Full name(s) and
address(es) of
Declarant(s)

I/~~We~~ Giichi Marushima
care of Canon Kabushiki Kaisha
30-2, 3-chome, Shimomaruko, Ohta-ku,
Tokyo, Japan

do solemnly and sincerely declare as follows:-

Full name(s) of
Applicant(s)

~~1. I am/We are the applicant(s) for the patent-~~

(or in the case of an application by a body corporate)

1. I am/~~We are~~ authorised by Canon Kabushiki Kaisha

the applicant(s) for the patent to make this declaration on
its/~~their~~ behalf.

2. The basic application(s) as defined by Section 141 of the
Act ~~was/were~~ made

Basic Country(ies)

in Japan

Priority Date(s)

on 4 October 1988, 4 October 1988, 4 October 1988,
25 May 1989 and 13 July 1989

Basic Applicant(s)

by
Canon Kabushiki Kaisha

Full name(s) and
address(es) of
inventor(s)

~~3. I am/We are the actual inventor(s) of the invention referred
to in the basic application(s)~~

(or where a person other than the inventor is the applicant)

Kenji Kagami, Akihiro Mouri, Masato Katayama, Kazuo Isaka,
3. Tetsuro Fukui, Susumu Nakamura and Masao Suzuki
1-7-505, Miyanosato 4-chome, Atsugi-shi, Kanagawa-ken;
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Yokohama-shi, Kanagawa-ken; 40-8 Tomigaya 2-chome, Shibuya-ku, Tokyo;
1458-4 Kajigaya, Miyamae-ku, Kawasaki-shi, Kanagawa-ken; 2-8 Miyauchi, Nakahara-ku,
Kawasaki-shi, Kanagawa-ken and 3-21 Higashi Yaguchi 1-chome, Ohta-ku, Tokyo
all in Japan (respectively)

Set out how Applicant(s)
derive title from actual
inventor(s) e.g. The
Applicant(s) is/are the
assignee(s) of the
invention from the
inventor(s)

~~is/are~~ the actual inventor(s) of the invention and the facts upon
which the applicant(s) ~~is/are~~ entitled to make the application are
as follows:

The said applicant is the assignee of the actual inventors.

4. The basic application(s) referred to in paragraph 2 of this
Declaration ~~was/were~~ the first application(s) made in a Convention
country in respect of the invention(s) the subject of the application.

Declared at Tokyo, Japan this 20th day of November 1989

CANON KABUSHIKI KAISHA

~~Giichi Marushima~~
Giichi Marushima, Managing Director

Signature of Declarant(s)

To: The Commissioner of Patents

11/81

(12) PATENT ABRIDGMENT (11) Document No. AU-B-42584/89
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 631145

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IMAGE FORMING METHOD AND IMAGE FORMING MEDIUM
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- (21) Application No. : **42584/89** (22) Application Date : **04.10.89**
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- (56) Prior Art Documents
US 4649098
EP 202490
- (57) Claim

1. An image forming method comprising:

subjecting an area of an image forming medium containing at least a photosensitive silver halide, an organic silver salt, a reducing agent, a polymerizable polymer precursor, and a photopolymerization initiator having an absorption peak wavelength λ_6 , to imagewise exposure to light, followed by heating to produce in said image forming medium a light-absorbing organic compound having an absorption peak wavelength λ_3 and a half-width $W_{1/2}$, as herein defined, wherein λ_6 is within the range of $\lambda_3 \pm 0.8 W_{1/2}$; and

subjecting said image forming medium in which said light-absorbing organic compound has been produced, to polymerization exposure to cause said polymerizable polymer precursor to polymerize;

where light-absorption characteristics of said light-absorbing organic compound are utilized to suppress the polymerization of said polymerizable polymer precursor at the area at which said light-absorbing organic compound has been produced, and

wherein the relationship between a first difference spectrum $G(\lambda)$ of light-absorption characteristics possessed by said image forming medium, light-absorption characteristics $f(\lambda)$ possessed by the area of said image

(11) AU-B-42584/89
(10) 631145

-2-

forming medium having been imagewise exposed to light and heated, and light-absorption characteristics $g(\lambda)$ possessed by an area of said image forming medium having not been imagewise exposed to light and heated, $G(\lambda_3)/f(800) \cdot g(800) = k$ (where λ_3 represents an absorption peak wavelength of said light-absorbing organic compound), is $k \geq 1.5$.

28. An image forming medium, comprising i) a photosensitive silver halide, an organic silver salt and a reducing agent that react with each other to produce a light-absorbing organic compound having an absorption peak wavelength λ_3 and a half-width $W_{1/2}$, as herein defined, as a result of imagewise exposure and heating of an area of said image forming medium, ii) a polymerizable polymer precursor, and iii) a photopolymerization initiator having an absorption peak wavelength λ_6 , wherein λ_6 is within the range of $\lambda_3 \pm 0.8 W_{1/2}$;

said light-absorbing organic compound being capable of absorbing light with wavelengths to which said photopolymerization initiator has a sensitivity; and

wherein the relationship between a first difference spectrum $G(\lambda)$ of light-absorption characteristics possessed by said image forming medium, light-absorption characteristics $f(\lambda)$ possessed by the area of said image forming medium having been imagewise exposed to light and heated, and light-absorption characteristics $g(\lambda)$ possessed by an area of said image forming medium having not been imagewise exposed to light and heated, $G(\lambda_3)/f(800) \cdot g(800) = k$ (where λ_3 represents an absorption peak wavelength of said light-absorbing organic compound), is $k \geq 1.5$.

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FORM 10

COMMONWEALTH OF AUSTRALIA

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COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE:

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Complete Specification Lodged:
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Related Art:

Name and Address
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Complete Specification for the invention entitled:

Image Forming Method and Image Forming Medium

The following statement is a full description of this invention, including the best method of performing it known to me/us

1 ABSTRACT OF THE DISLCOUSRE

An image forming method comprises;

subjecting an image forming medium containing

at least a photosensitive silver halide, an organic

5 silver salt, a reducing agent, a polymerizable polymer

precursor and a photopolymerization initiator, to

imagewise exposure, followed by heating to produce a

light-absorbing organic compound in said image forming

medium; and subjecting said image forming medium in

10 which said light-absorbing organic compound has been

produced, to polymerization exposure to cause said

polymerizable polymer precursor to polymerize; where

the light-absorption characteristics of said light-

absorbing organic compound are utilized to suppress

15 the polymerization of said polymerizable polymer

precursor at the area at which said light-absorbing

organic compound has been prduced.

20

25

1 TITLE OF THE INVENTION

Image Forming Method and Image Forming Medium

BACKGROUND OF THE INVENTION

5 Field of the Invention

The present invention relates to an image forming method that forms a polymer image by the action of light, and also to an image forming medium.

Related Background Art

10 Energies used to form or record an image include light, sound, electricity, magnetism, heat, radiations such as electron rays and X-rays, and chemical energy, among which, in particular, widely used are light, electricity, heat energy, or a
15 combination of any of these.

For example, the image forming method that employs the combination of light energy with chemical energy includes a silver salt photographic process and a method in which a diazo copying paper is used. The
20 method that employs the combination of light energy with electric energy includes an electrophotographic system. Also, the method that utilizes heat energy includes a method in which a thermal recording paper or transfer recording paper is used. On the other
25 hand, known as the method that utilizes electric energy is a method in which an electrostatic recording

1 paper, electrothermal recording paper, or
electrosensitive recording paper is used.

Of the above image forming methods, the silver
salt photographic process can obtain an image having a
5 high resolution. The silver salt photographic
process, however, requires the developing and fixing
that uses complicated liquid compositions, or the
drying of an image (or a print).

Now, development is energetically made on
10 image forming methods that can form an image through a
simple processing.

For example, U.S. Patent No. 4,629,676 teaches
a method in which polymerization reaction under dry
(thermal) conditions is caused by the photosensitive
15 reaction of silver halide that acts as a trigger, to
form an image comprising a polymer.

This method has the advantage that any
complicated wet processing is not required, but has
had the disadvantage that the polymer formation rate
20 (i.e., polymerization rate of a polymeric compound) is
so low that it takes a long time to form the polymer
image. Incidentally, this disadvantage arises
presumably because of a reaction intermediate (which
functions as a polymerization initiator) formed in the
25 course of heating, by the reaction between silver
produced from silver halide by imagewise exposure and

1 a reducing agent, which intermediate is so stable and
has so low activity as the polymerization initiator
that the polymerization reaction can not proceed so
rapidly.

5 On the other hand, to cope with this problem
to accelerate the polymerization, Japanese Unexamined
Patent Publication No. 70836/1987 discloses a method
in which a thermal polymerization initiator is used.

This method comprises forming a latent image
10 comprising silver metal produced from silver halide by
imagewise exposure, converting, under heating, a
reducing agent into an oxidized product having a
polymerization inhibitory power different from that of
said reducing agent by utilizing a catalytic action of
15 the above silver metal, thereby producing a difference
in the polymerization inhibitory power between the
reducing agent and the resulting oxidized product and
also causing a thermal polymerization reaction
utilizing the thermal polymerization initiator, thus
20 forming a polymer image corresponding with the
difference in the polymerization inhibitory power.

This method, however, has been involved in the
disadvantage that a good contrast can be made with
difficulty in the polymer image.

25 This disadvantage arises presumably because
the oxidation-reduction reaction taking place in a

1 latent image portion to form the oxidized product and
the polymerization reaction to form the polymer image
are allowed to take place in the same heating step, so
that these reactions may proceed in a competitive
5 fashion and thus the respective reactions may not
proceed in a good efficiency.

Also, the image formation according to this
method is very unstable in that, for example, the
areas on which the polymer is formed may turn into
10 exposed areas or unexposed areas only because of a
slight change in the amount of the reducing agent.

In addition, U.S. Patent No. 4,649,098
discloses a method in which a reducing agent having a
polymerization inhibitory power is brought into an
15 oxidized product by imagewise consumption (at
imagewise exposed areas) in the course of the
developing of silver halide, and, after imagewise
inhibition (at imagewise unexposed areas) of
polymerization reaction by the action of the residual
20 reducing agent, light energy is uniformly applied
(whole areal exposure) from the outside to cause
photopolymerization at the area at which the reducing
agent has been consumed (imagewise exposed area), thus
forming a polymer image.

25 The above method has the advantages that it
can achieve a high sensitivity in the writing of a

1 latent image since the silver halide is used, and the
steps from the writing for the formation of an image
up to the whole areal exposure can be separated in a
good efficiency. It, however, is difficult to obtain
5 a polymer image having a sufficient contrast. This is
caused for the following reason.

The reducing agent used in the above method is
in itself a reducing agent that acts as a
polymerization inhibitor and turns not to act as the
10 polymerization inhibitor after the reduction of silver
halide. Hence the reducing agent at the imagewise
exposed area must be sufficiently converted into the
oxidized product before the polymerization can be
sufficiently achieved. However, the application of
15 heat energy in an sufficient amount in carrying out
the development, with the intention to sufficiently
convert the reducing agent at the imagewise exposed
area into the oxidized product may cause an
unauthorized oxidation-reduction reaction at the
20 imagewise unexposed areas. On the other hand, the
application of heat energy in a reduced amount in
carrying out the development, with the intention to
prevent the oxidation-reduction reaction from taking
place at the imagewise unexposed area, may conversely
25 make the conversion into the oxidized product at the
imagewise exposed areas not to sufficiently proceed.

1 Since in this instance the imagewise exposed area of
an oxidation-reduction image is polymerized with
difficulty, the light energy in carrying out the whole
areal exposure must be applied in an increased amount.

5 This may cause unnecessary polymerization at the
unexposed areas with increase in the amount of the
light energy. Further, since the silver metal is
deposited at the area to be polymerized, the light
energy of the whole areal exposure is absorbed so that
10 the imagewise exposed area and unexposed area become
different in the point of the irradiation energy. As
a result, the polymerization at the unexposed area is
more apt to proceed, eventually making it impossible
to obtain the polymer image with a sufficient
15 contrast.

The polymer image to be formed according to
the methods as described above is an image comprising
a polymerized area and an unpolymerized area. Aiming
at making this polymer image visible and further
20 forming it into a color image, U.S. Patent No.
4,649,098 and so forth disclose various methods that
utilize the difference in properties and so forth
between the polymerized area and unpolymerized area.
For example, proposed are a method in which a
25 treatment is made using a liquid that does not
dissolve the polymerized area and dissolves the layer

1 of the unpolymerized area, to dissolve out and remove
the unpolymerized area (i.e., etching); a method in
which, utilizing the difference in adhesion between
the polymerized area and unpolymerized area, a sheet
5 such as plastic film is adhered and thereafter peeled
to separate the polymerized area and unpolymerized
area under dry conditions (i.e., peeling-apart); in
the case when the polymer image is formed into a color
image, a method in which a photopolymerizable layer is
10 previously colored with use of a pigment or dye, which
is then subjected to dissolving-out (i.e., the above
etching) or peeling (i.e., the above peeling-apart) to
form the color image, or a method in which, utilizing
the adhesion at the unpolymerized area, a coloring
15 powder is applied to make selective coloring (i.e.,
toning or inking), or, utilizing the difference in
liquid-permeability between the polymerized area and
unpolymerized area, the unpolymerized area is
selectively dyed by treating it with a dye solution.

20 However, no polymer image having a sufficient
contrast can be obtained in the conventional polymer
image forming methods as discussed above, and hence,
even with employment of any of the above methods for
making the image visible or forming it into a color
25 image, the visible image and color image which are
obtained from such a polymer image can not have any

1 sufficient contrast, and particularly it has been
difficult to obtain highly detailed visible image and
color image.

Japanese Unexamined Patent Publication No. 55-
5 50246 also discloses a photosensitive lithographic
material that has a photopolymerizable composition
layer, a transparent intermediate layer and a heat
development type photosensitive composition layer, and
is capable of forming a polymer image in the
10 photopolymerizable composition layer with utilization
of the light-absorption of the metallic silver which
is produced at the exposed area of the heat
development type photosensitive composition layer as a
result of imagewise exposure and heating (a plate is
15 finally obtained by peeling-apart).

The metallic silver, however, has so flat
light-absorption characteristics that it is hard to
say that the ability to absorb a particular wavelength
is satisfactory. Hence, it is necessary for achieving
20 sufficient absorption of light to make the
photosensitive layer thick. This results in a
lowering of the resolution of the polymer image. When
a method is employed in which the quantity of the
organic silver salt per unit area is increased to
25 achieve sufficient absorption of light, there also has
been the problem that the storage stability of image

forming mediums is lowered.

Summary Of The Invention

An object of the present invention is to provide an image forming method, and an image forming medium, that can obtain an image having a superior resolution and contrast even with use of a small amount of organic silver salt.

According to a first embodiment of this invention, there is provided an image forming method comprising:

subjecting an area of an image forming medium containing at least a photosensitive silver halide, an organic silver salt, a reducing agent, a polymerizable polymer precursor, and a photopolymerization initiator having an absorption peak wavelength λ_6 , to imagewise exposure to light, followed by heating to produce in said image forming medium a light-absorbing organic compound having an absorption peak wavelength λ_3 and a half-width $W_{1/2}$, as herein defined, wherein λ_6 is within the range of $\lambda_3 \pm 0.8 W_{1/2}$; and

subjecting said image forming medium in which said light-absorbing organic compound has been produced, to polymerization exposure to cause said polymerizable polymer precursor to polymerize;

where light-absorption characteristics of said light-absorbing organic compound are utilized to suppress the polymerization of said polymerizable polymer precursor at the area at which said light-absorbing organic compound has been produced, and

wherein the relationship between a first difference spectrum $G(\lambda)$ of light-absorption characteristics possessed by said image forming medium, light-absorption characteristics $f(\lambda)$ possessed by the area of said image forming medium having been imagewise exposed to light and heated, and light-absorption characteristics $g(\lambda)$ possessed by an area of said image forming medium having not been imagewise exposed to light and heated, $G(\lambda_3)/f(800)-g(800) = k$ (where λ_3 represents an absorption peak wavelength of said light-absorbing organic compound), is $k \geq 1.5$.

According to a second embodiment of this invention, there is provided an image forming method comprising;

subjecting an area of a photosensitive material containing at least a photosensitive silver halide, an organic silver salt and a reducing agent, to imagewise exposure, followed by heating to produce in said photosensitive material a light-absorbing organic compound having an absorption peak wavelength λ_3 and half-width $W_{1/2}$, as herein defined;



laminating a polymerization material containing at least a polymerizable polymer precursor and a photopolymerization initiator having an absorption peak wavelength λ_6 , in which said light-absorbing organic compound has been produced, on said photosensitive material, wherein λ_6 is within the range of $\lambda_3 \pm 0.8 W_{1/2}$; and

subjecting said photosensitive material and said polymerization material to polymerization exposure to cause said polymerizable polymer precursor to polymerize;

where light-absorption characteristics of said light-absorbing organic compound are utilized to suppress the polymerization of said polymerizable polymer precursor at the area at which said light-absorbing organic compound has been produced, and

wherein the relationship between a first difference spectrum $G(\lambda)$ of light-absorption characteristics possessed by said photosensitive material, light-absorption characteristics $f(\lambda)$ possessed by the area of said photosensitive material having been imagewise exposed to light and heated, and light-absorption characteristics $g(\lambda)$ possessed by an area of said photosensitive material having not been imagewise exposed to light and heated, $G(\lambda_3)/f(800)-g(800) = k$ (where λ_3 represents an absorption peak wavelength of said light-absorbing organic compound), is $k \geq 1.5$.

According to a third embodiment of this invention, there is provided an image forming medium, comprising i) a photosensitive silver halide, an organic silver salt and a reducing agent that react with each other to produce a light-absorbing organic compound having an absorption peak wavelength λ_3 and a half-width $W_{1/2}$, as herein defined, as a result of imagewise exposure and heating of an area of said image forming medium, ii) a polymerizable polymer precursor, and iii) a photopolymerization initiator having an absorption peak wavelength λ_6 , wherein λ_6 is within the range of $\lambda_3 \pm 0.8 W_{1/2}$;

said light-absorbing organic compound being capable of absorbing light with wavelengths to which said photopolymerization initiator has a sensitivity; and

wherein the relationship between a first difference spectrum $G(\lambda)$ of light-absorption characteristics possessed by said image forming medium, light-absorption characteristics $f(\lambda)$ possessed by the area of said image forming medium having been imagewise exposed to light and heated, and light-absorption characteristics $g(\lambda)$ possessed by an area of said image forming medium having not been imagewise exposed to light and heated,



$G(\lambda_3)/f(800)-g(800) = k$ (where λ_3 represents an absorption peak wavelength of said light-absorbing organic compound), is $k \geq 1.5$.

Brief Description Of The Drawings

Figs. 1 to 3 are side views to illustrate an example of the step of
5 imagewise exposure, the step of heating and the step of polymerization,
respectively, of the present invention;

Fig. 4 is a graph to show an example of the light-absorption
characteristics at the area having been imagewise exposed to light and heated,
of an image forming medium;

10 Fig. 5 is a graph to show an example of the light-absorption
characteristics at the area having not been imagewise exposed to light and
heated, of an image forming medium;

Fig. 6 is a graph to show an example of a first-difference spectrum;

Fig. 7 is a graph to show an example of a second-difference spectrum;

15 Fig. 8 is a graph to show an example of the



1 relationship between the absorption peak wavelength λ_3
of the light-absorbing organic compound and the
absorption peak wavelength λ_6 of the
photopolymerization initiator in the present
5 invention;

Figs. 9 to 11 are side views to illustrate
another example of the step of imagewise exposure, the
step of heating and the step of polymerization,
respectively, of the present invention;

10 Fig. 12 is a side view to illustrate an
example of the photosensitive material and
polymerization material used in the separation process
according to the present invention;

15 Fig. 13 is a side view to illustrate an
example of the step of transferring the heat-
diffusible coloring matter in the image forming method
of the present invention;

Fig. 14 is a side view to illustrate an
example of the step of transferring the heat-
20 diffusible coloring matter contained in a polymerizing
layer in the image forming method of the present
invention;

Fig. 15 is a side view to illustrate an
example of an image receiving medium to which the heat-
25 diffusible coloring matter has been transferred;

Fig. 16 is a side view to illustrate an

1 example of the state in which the polymerizing step
has been completed in the peeling-apart according to
the present invention; and

Fig. 17 is a side view to illustrate an
5 example of the step of peeling the image receiving
medium in the peeling-apart according to the present
invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

10 As shown in Fig. 1, the image forming medium
of the present invention comprises at least an image
forming layer 1 provided on a support 2. The image
forming layer 1 contains a photosensitive silver
halide, an organic silver salt, a reducing agent, a
15 polymerizable polymer precursor, and a
photopolymerization initiator. In the image forming
medium of the present invention, the organic silver
salt and reducing agent contained in the image forming
layer 1 undergo oxidation-reduction reaction as a
20 result of subjecting the image forming layer 1 to
exposure and heating (heat development), and the
oxidized product produced as a result of the reaction
serves as the light-absorbing organic compound.
Alternatively, the oxidized product produced as a
25 result of the reaction between the organic silver salt
and reducing agent further reacts with a coupler to

1 produce the light-absorbing organic compound.

Now, to form an image by using the above image forming medium, the image forming layer 1 on the support 2 is, as shown in Fig. 1, first imagewise
5 exposed to light in a desired form in the step of imagewise exposure, according to analog exposure using a mask or the like, or digital exposure in which exposure is carried out using a laser or the like according to image signals such as external electric
10 signals or light signals ($h\nu_1$). As a result, silver metal 3 is produced from the photosensitive silver halide present in the imagewise exposed area 1a, and this forms a latent image. The silver metal 3 serves as a catalyst for the thermal reaction between the
15 organic silver salt and reducing agent.

As conditions for the exposure to light in carrying out the writing of this latent image, conditions under which the resulting polymer image can obtain the desired performance such as sufficient
20 contrast may be used by appropriately selecting them depending on the concentration, type and so forth of the silver halide incorporated into the image forming layer.

The image forming method of the present
25 invention, which employs the photosensitive silver halide in the step of imagewise exposure, enables

¹ highly sensitive writing.

Next, in the step of heating, the image forming layer 1 in which the latent image has been formed is heated, so that as shown in Fig. 2 the ⁵ silver metal 3 selectively acts as a catalyst in the imagewise exposed area 1a, where the organic silver salt reacts with the reducing agent. The organic silver salt is reduced to a silver atom (metallic silver) and at the same time the reducing agent is ¹⁰ oxidized to form an oxidized product 5. This oxidized product 5 has light absorption. In another instance, the oxidized product 5 further reacts with a coupler to produce an organic compound that exhibits light absorption.

¹⁵ The heating in this heating step is carried out under appropriate selection of conditions necessary for the progress of oxidation-reduction reaction and the formation of the light-absorbing organic compound. The heating temperature depends on ²⁰ the composition of mediums and can not be sweepingly defined. However, the heating may preferably be carried out at a temperature of from 60°C to 200°C, and more preferably from 100°C to 150°C, for 1 second to 5 minutes, and more preferably for 3 seconds to ²⁵ 60 seconds. In general, high temperatures can complete the heating in a short time and low temperatures may

1 require the heating to be carried out for a long time.
A heating means includes a method in which a hot
plate, a heat roll, a thermal head or the like is
used, as well as a method in which a heating element
5 provided on the support is electrified to carry out
heating, or a method in which the heating is carried
out by irradiation with laser beams.

Subsequently, in the step of polymerization,
the image forming layer 1 is subjected to
10 polymerization exposure ($h\nu_2$).

As a result of the polymerization exposure
($h\nu_2$) on the whole surface of the image forming layer
1, the polymerizable polymer precursor is polymerized
by the action of the photopolymerization initiator.
15 On the other hand, the light-absorbing organic
compound is present at the imagewise exposed area 1a,
and therefore the light with wavelengths for the
polymerization exposure is absorbed into that area, so
that no polymerization proceeds there, compared with
20 the imagewise unexposed area 1b. Hence, a difference
in the state of polymer formation occurs between the
imagewise exposed area 1a and imagewise unexposed area
1b, so that a polymer area 6 as shown in Fig. 3 is
selectively formed. In other words, there is formed
25 the polymer image.

In the step of polymerization, the light used

1 in subjecting the image forming layer to the
polymerization exposure is the light with wavelengths
to which the photopolymerization initiator (in the
present invention, photopolymerization initiator is
5 defined to include a sensitizer) has a sensitivity and
also which the light-absorbing organic compound can
absorb (i.e., light with effective wavelengths).

However, light with wavelengths other than the
light with effective wavelengths may also be used in
10 combination within the purport that the desired
polymer image can be obtained. In instances in which
the wavelength regions must be limited, the exposure
may be carried out using, for example, a filter that
does not allow certain wavelength light to pass.

15 In the present invention, the light-absorption
characteristics of the light-absorbing organic
compound and the light-absorption characteristics of
the photopolymerization initiator may preferably meet
the conditions described below, in order that the
20 light with effective wavelengths is present and an
image with a good contrast can be formed. In the
present invention, the light-absorption
characteristics are measured using UVIDEC-650,
manufactured by Nippon Bunko Kogyo K.K. Air was used
25 as the reference.

The light-absorption characteristics of the

1 light-absorbing organic compound show an absorption
peak in a specific wavelength. The absorption peak of
this light-absorbing organic compound can be
substantially specified by measuring the light-
5 absorption characteristics $f(\lambda)$ at the area imagewise
exposed to light and heated, of an image forming
medium, as shown in Fig. 4, at the time the light-
absorbing organic compound has been produced in the
image forming layer, in other words, at the time the
10 imagewise exposure step and heating step have been
completed.

The light-absorption characteristics at the
area imagewise exposed to light and heated, of the
image forming medium may largely vary in the O.D value
15 A_1 depending on conditions in the imagewise exposure
step and heating step, and hence, in the present
invention, the light-absorption characteristic
observed when $A_1 = 3.0$ is regarded as $f(\lambda)$.

Incidentally, the light-absorption
20 characteristic $f(\lambda)$ shown in Fig. 4 not only indicates
the light-absorption characteristics of the light-
absorbing organic compound but also includes the light-
absorption characteristics of other components, e.g.,
the photopolymerization initiator having an absorption
25 peak. For this reason, the wavelength λ_1 at an
absorption peak of $f(\lambda)$ can not necessarily be said to

¹ be the absorption peak wavelength of the light-absorbing organic compound.

Now, the light-absorption characteristic $g(\lambda)$ (Fig. 5) of the image forming medium which is in the
5 state that the light-absorbing organic compound has not been produced, i.e., which has not been imagewise exposed to light nor heated is measured, and a first-difference spectrum $G(\lambda)$ is found by subtracting $g(\lambda)$ from $f(\lambda)$ as shown in Fig. 6. Thus, the absorption
10 peak wavelength λ_3 of this first-difference spectrum $G(\lambda)$ is found. The first-difference spectrum $G(\lambda)$ corresponds to the light-absorption characteristics from which the influences by the photopolymerization initiator and other components have been removed, so
15 that the absorption peak wavelength λ_3 of $G(\lambda)$ coincides with the absorption peak wavelength of the light-absorbing organic compound, and $G(\lambda_3)$ represents optical density at λ_3 . Since, however, the light-absorption characteristics $f(\lambda)$ of the image forming
20 medium having been imagewise exposed to light and heated include the light-absorption characteristics of the metallic silver produced as a result of imagewise exposure and heating (no metallic silver is produced at the area having been not imagewise exposed to light
25 and hence the light-absorption characteristics of the metallic silver is not included in $g(\lambda)$), the first-

1 difference spectrum $G(\lambda)$ also includes the light-
absorption characteristics of the metallic silver.
The metallic silver, however, shows substantially a
constant light absorption and has no large absorption
5 peak. Hence, the absorption peak wavelength λ_3 of the
first-difference spectrum $G(\lambda)$ corresponds to the
absorption peak wavelength of the light-absorbing
organic compound.

The light-absorption characteristics of the
10 metallic silver is substantially constant as mentioned
above. Thus the flat part in $G(\lambda)$ in Fig. 6 indicates
the light-absorption characteristics of the metallic
silver. In the present invention, the absorption (A_2 -
 A_4) at a wavelength of 800 nm is regarded as the light-
15 absorption characteristics of the metallic silver. A_2
represents the absorption at 800 nm of $f(\lambda)$, and A_4 ,
the absorption at 800 nm of $g(\lambda)$. The difference
between A_2 and A_4 is due to the fact that the metallic
silver has been formed at the exposed area.

20 In the present invention, a great difference
between the wavelength that gives the absorption peak
of the light-absorbing organic compound and the
wavelength that gives the absorption peak of the
photopolymerization initiator may result in a lowering
25 of the action attributable to the light-absorbing
organic compound to make it difficult to obtain a

sharp image.

Researches made by the present inventors revealed that, forming an idea of a second-difference spectrum $F(\lambda)$ (Fig. 7) obtainable by further subtracting the absorption of the metallic silver (A_2-A_4 in Fig. 6) from the first-difference spectrum $G(\lambda)$, a sharp image can be obtained when, assuming the half-width of this second-difference spectrum $F(\lambda)$ as $W_{1/2}$, the wavelength λ_6 that gives the absorption peak of the photopolymerization initiator is within the range of $\lambda_3 \pm 0.8 W_{1/2}$, and more preferably within the range of $\lambda_3 \pm 0.5 W_{1/2}$; in other words, assuming $\lambda_6 = \lambda_3 \pm a W_{1/2}$, a may preferably satisfy $0 \leq a \leq 0.8$, and more preferably $0 \leq a \leq 0.5$.

Throughout the specification and claims the term " $W_{1/2}$ " is to be taken as meaning the half-width of the second-difference spectrum $F(\lambda)$ of light-absorption characteristics possessed by the light-absorbing organic compound.

The second-difference spectrum $F(\lambda)$ does not include the light-absorption characteristics of the metallic silver, and hence can be regarded as the light-absorption characteristics of only the light-absorbing organic compound. Based on this second-difference spectrum $F(\lambda)$, λ_4 and λ_5 corresponding to $\frac{1}{2}F(\lambda_3) = F(\lambda_4) = F(\lambda_5)$ are primarily determined to find the half-width of $W_{1/2} = \lambda_5 - \lambda_4$.

Fig. 8 shows the relationship between the absorption peak wavelength λ_3 of the light-absorbing organic compound and the absorption peak wavelength λ_6 of the photopolymerization initiator in the present



1 invention. In Fig. 8, $I(\lambda)$ represents the light-
absorption characteristics of the photopolymerization
initiator.

As will be detailed later, in the instance
5 where the image forming layer is separated into a
photosensitive layer and a polymerizing layer, and,
after the photosensitive layer has been imagewise
exposed to light and heated, the photosensitive layer
and polymerizing layer are laminated to form a polymer
10 image (separation process), the $f(\lambda)$ may be regarded
as the light-absorption characteristics of a
photosensitive material having been imagewise exposed
to light and heated to have $A_1 = 3.0$, and the $g(\lambda)$ may
be regarded as the light-absorption characteristics of
15 a photosensitive material having not been imagewise
exposed to light and heated. In this instance, the
absorption peak wavelength of the photopolymerization
initiator can be specified from the absorpior peak
wavelength of the polymerizing layer on which the
20 light-absorption characteristics have been determined.

In an instance where the image forming layer
is constituted of a single layer and, as will be
detailed later, in the instance where the image
forming layer is constituted of a multiple layer
25 containing the polymerizing layer and photosensitive
layer and the polymerizing layer and photosensitive

1 layer have been already laminated before they are
imagewise exposed to light, the manner by which $f(\lambda)$
and $g(\lambda)$ are found may be in accordance with what has
been already described. In this instance, however,
5 the absorption peak wavelength of the
photopolymerization initiator coincides with the
absorption peak wavelength of $g(\lambda)$. In other words,
 λ_2 coincides with λ_6 .

In Fig. 6, when the relationship between $G(\lambda_3)$
10 and the optical density ($A_2 - A_4$) of the metallic
silver, i.e., $G(\lambda_3)/(A_2 - A_4) = k$, is $k \geq 1.5$, a sharp
image with a good contrast can be obtained with ease
even with use of a small amount of organic silver
salt.

15 In forming an image according to the present
invention, the O.D value of the absorption peak
(attributable to the light-absorbing organic compound)
of the image forming medium (or the photosensitive
layer in the instance of the separation process) may
20 preferably be not less than 3.0 at the time the
imagewise exposure step and heating step have been
completed. When the above $G(\lambda_3)/(A_2 - A_4) = k$ is not
less than 1.5, the O.D value of the absorption peak of
the image forming medium (or the photosensitive layer
25 in the instance of the separation process) can be
readily made to be not less than 3.0.

1 An excessively high O.D value $A_3 = g(\lambda_2)$ (the
O.D value at the absorption peak of the polymerizing
layer, in the instance of the separation process) in
respect of $g(\lambda)$ in Fig. 5 may also result in a
5 lowering of the contrast of an image. Thus, the O.D
value $A_3 = g(\lambda_2)$ may preferably be not more than 1/2,
more preferably not more than 1/3, and particularly
preferably not more than 1/4, of the absorption peak
(attributable to the light-absorbing organic compound)
10 of the image forming medium (or the photosensitive
layer in the instance of the separation process) at
the time the step of imagewise exposure and the step
of heating have been completed.

In the instance where the image forming medium
15 has the support, $f(\lambda)$ and $g(\lambda)$ may be measured in a
state that the support has been peeled, or may be
measured in a state that it remains unremoved. When,
however, the opaqueness of the support makes it
impossible to measure the light-absorption
20 characteristics, the support is peeled to carry out
the measurement. Also when an anti-halation layer is
provided in the image forming medium, this anti-
halation layer is peeled to carry out the measurement.

Still also when a coloring material layer is provided
25 in addition to the image forming layer or polymerizing
layer as will be detailed later, the coloring material

1 layer is removed to carry out the measurement.

As light sources used in the step of imagewise exposure and the step of polymerization, usable are, for example, sunlight, tungsten lamps, mercury lamps, 5 halogen lamps, xenon lamps, fluorescent lamps, LEDs, and lasers, and the wavelength of the light used in these steps may be the same or different. Even if the light having the same wavelength is used, the latent image can be sufficiently written with use of light 10 having an intensity of the level that may not cause photopolymerization in the step of imagewise exposure, since the silver halide usually has a sufficiently higher photosensitivity than the photopolymerization initiator. For example, in the step of imagewise 15 exposure, the exposure may be carried out using light that may give about 1 mJ/cm^2 or less at the surface of the image forming medium. In the step of polymerization exposure, the exposure may be carried out using light that may give about 500 mJ/cm^2 or less 20 at the surface of the image forming medium.

In the step of polymerization exposure, the image forming medium may be heated when exposed to light. This may be done by additional heating, or the thermal inertia in the step of heating may be 25 utilized.

Examples of the image forming medium that can

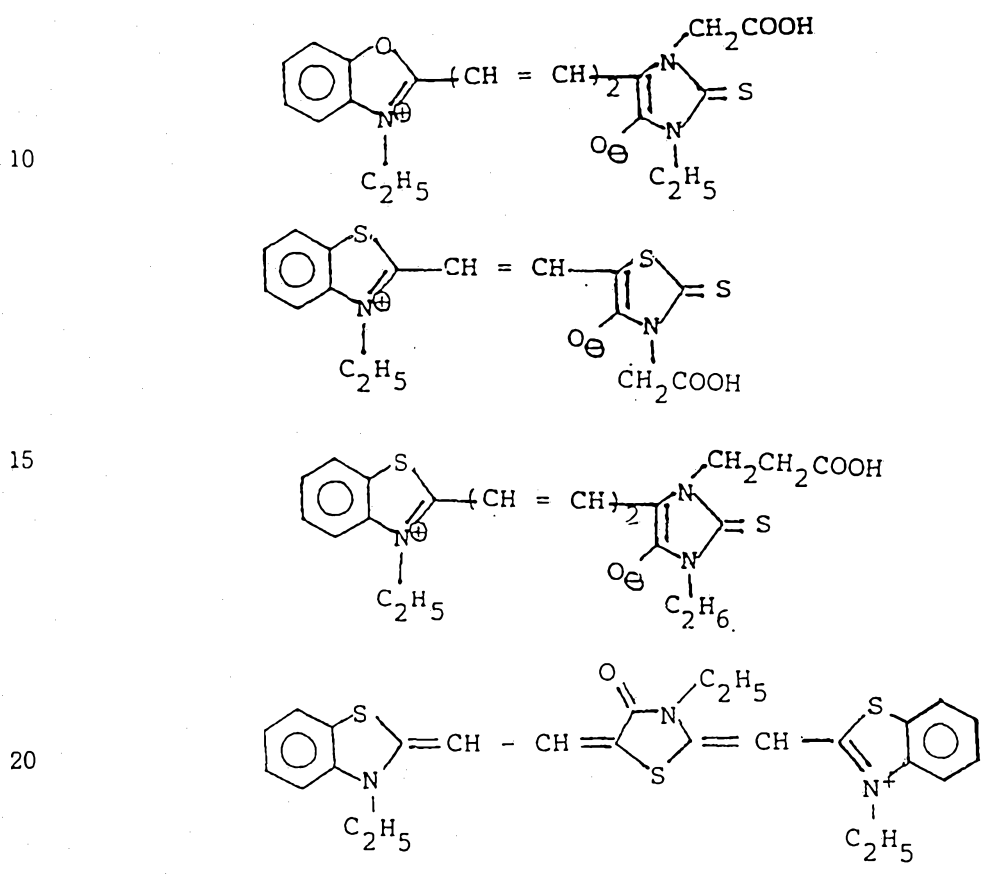
1 be used in the image forming method of the present invention will be described below in detail.

The image forming medium of the present invention contains at least i) a photosensitive silver
5 halide, an organic silver salt and a reducing agent that react each other to produce a light-absorbing organic compound as a result of imagewise exposure and heating, ii) a polymerizable polymer precursor, and
10 iii) a photopolymerization initiator; said light-absorbing organic compound being capable of absorbing light with wavelengths to which said
photopolymerization initiator has a sensitivity.

The photosensitive silver halide used in the medium of the present invention may include silver
15 chloride, silver bromide, silver chlorobromide, silver iodobromide, and silver chloriodobromide. These may have been subjected to chemical sensitization and optical sensitization as done in respect of usual
20 photographic emulsions. More specifically, the chemical sensitization that can be used includes sulfur sensitization, noble metal sensitization, and reduction sensitization. The optical sensitization that can be applied includes methods using
conventionally known sensitizing coloring matters.

25 The sensitizing coloring matters that may be preferably used include cyanine coloring matters,

1 merocyanine coloring matters, and trinuclear coloring
 matters, as exemplified by 3,3'-dicarboxyethyl-2,2'-
 thiocarbocyanine iodide, 3,3'-diethyl-2,2'-
 thiocarbocyanine iodide, 3,3'-disulfoethyl-2,2'-
 5 thiadicarbocyanine bromide, 3,3'-diethyl-2,2'-
 thiatricarbocyanine iodide, and further the coloring
 matters having the following structural formula:



The halogen composition in a grain may be
 uniform, or the grain may have a multi-layer structure
 25 with different composition. It is also possible to
 use simultaneously two or more kinds of silver halides

1 having different halogen composition, grain size,
grain size distribution, etc.

The organic silver salt that can be used in
the medium of the present invention includes organic
5 acid silver salts or triazole silver salts as
described in SHASHIN KOGAKU NO KISO (Basic
Photographic Engineering), First Edition, published
1982, The Non-silver Salt Volume, p.247, or Japanese
Unexamined Patent Publication No. 59-55429. It is
10 preferred to use silver salts having a low
photosensitivity. They include, for example, silver
salts of aliphatic carboxylic acids, aromatic
carboxylic acids, thiocarbonyl compounds having a
mercapto group or α -hydrogen, and imino group-
15 containing compounds.

The aliphatic carboxylic acids include acetic
acid, butyric acid, succinic acid, sebacic acid,
adipic acid, oleic acid, linolic acid, linolenic acid,
tartaric acid, palmitic acid, stearic acid, behenic
20 acid and camphor acid. In general, however, silver
salts are not stabler as they have a smaller number of
carbon atoms, and hence those having an appropriate
number of carbon atoms (as exemplified by those having
16 to 26 carbon atoms) are preferred.

25 The aromatic carboxylic acids include benzoic
acid derivatives, quinolinic acid derivatives,

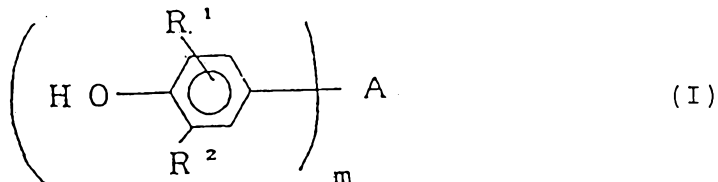
1 naphthalene carboxylic acid derivatives, salicylic
acid derivatives, gallic acid, tannic acid, phthalic
acid, phenyl acetic acid derivatives, and pyromellitic
acid.

5 The compounds having a mercapto or
thiocarbonyl group include 3-mercapto-4-phenyl-1,2,4-
triazole, 2-mercaptobenzoimidazole, 2-mercapto-5-
aminothiadiazole, 2-mercaptobenzothiazole, s-
alkylthioglycolic acid (alkyl group carbon atom number
10 of 12 to 23), dithiocarboxylic acids such as
dithioacetic acid, thioamides such as thiostearoamide,
and mercapto compounds such as 5-carboxy-1-methyl-2-
phenyl-4-thiopyridine, mercaptotriazine, 2-
mercaptobenzoxazole, mercaptooxadiazole, and 3-amino-5-
15 benzylthio-1,2,4-triazole, which are described in U.S.
Patent No. 4,123,274.

 The compounds having an imino group typically
include benzotriazole or derivatives thereof,
described in Japanese Patent Publication No. 44-30271
20 or No. 42-18416, as exemplified by benzotriazole and
alkyl-substituted benzotriazoles such as
methylbenzotriazole, halogen-substituted
benzotriazoles such as 5-chlorobenzotriazole,
carboimidobenzotriazoles such as
25 butylcarboimidobenzotriazole, nitrobenzotriazoles,
described in Japanese Unexamined Patent Publication

1 No. 58-118638, sulfobenzotriazole,
carboxybenzotriazole or salts thereof, or
hydroxybenzotriazole, described in Japanese Unexamined
Patent Publication No. 58-118639, 1,2,4-triazole,
5 described in U.S. Patent No. 4,220,709, or 1H-
tetrazole, carbazole, saccharin, imidazole, and
derivatives thereof.

The reducing agent that turns into the light-
absorbing organic compound as a result of oxidation-
10 reduction reaction includes, for example, the compound
represented by the following Formula (I):



In the above Formula (I), R¹ and R² each
independently represent a hydrogen atom, a hydroxyl
group, a halogen atom, a substituted or unsubstituted
20 alkyl group, a substituted or unsubstituted alkenyl
group, a substituted or unsubstituted alkynyl group, a
substituted or unsubstituted cycloalkyl group, a
substituted or unsubstituted aralkyl group, an alkoxy
group, or a substituted or unsubstituted amino group;
25 m represents an integer of 1 to 3; and A is a
monovalent, divalent or trivalent group and represents

1 a substituted or unsubstituted aralkyl group, a
substituted or unsubstituted alkyl group, a
substituted amino group, a divalent alkylidene group,
a divalent aralkylidene group, or a trivalent methine
5 group.

In the above Formula (I), The unsubstituted
alkyl group represented by R^1 and R^2 may preferably
include a straight-chain or branched alkyl having 1 to
18 carbon atoms, as exemplified by methyl, ethyl,
10 propyl, i-propyl, butyl, t-butyl, i-butyl, amyl, i-
amyl, sec-amyl, ~~tercyl~~, 1,1,2,2-tetramethylethyl
(hereinafter called "tercyl"), heptyl, octyl, nonyl,
dodecyl, and stearyl.

The substituted alkyl group represented by R^1
15 and R^2 may preferably include an alkoxyalkyl group
having 2 to 18 carbon atoms, a halogenoalkyl group
having 1 to 18 carbon atoms, a hydroxyalkyl group
having 1 to 18 carbon atoms, and an aminoalkyl group
having 1 to 18 carbon atoms.

20 For example, the alkoxyalkyl group includes
methoxyethyl, ethoxymethyl, ethoxyethyl, ethoxypropyl,
ethoxybutyl, propoxymethyl, propoxybutyl, i-
propoxypentyl, t-butoxyethyl, and hexyloxybutyl.

The halogenoalkyl group includes, for example,
25 chloromethyl, chloroethyl, bromoethyl, chloropropyl,
chlorobutyl, chlorohexyl, and chloroxyl.



1 The hydroxyalkyl group includes, for example,
hydroxymethyl, hydroxyethyl, hydroxypropyl,
hydroxybutyl, hydroxypentyl, hydroxyhexyl, and
hydroxyheptyl.

5 The aminoalkyl group includes, for example,
aminomethyl, acetylaminomethyl, dimethylaminomethyl,
aminoethyl, acetylaminoethyl, dimethylaminoethyl,
diethylaminoethyl, morpholinoethyl, piperidinoethyl,
diethylaminopropyl, dipropylaminoethyl,
10 acetylaminopropyl, aminobutyl, and morpholinobutyl.

 The alkenyl group represented by R^1 and R^2
includes, for example, vinyl, allyl, pulenyl, butenyl,
pentenyl, hexenyl, heptenyl, and octenyl.

 The alkynyl group includes, for example,
15 acetyl, propargyl, butynyl, pentynyl, hexynyl,
heptynyl, and octynyl.

 The cycloalkyl group includes, for example,
cyclopentyl, cyclohexyl, and cycloheptyl.

 The aralkyl group represented by R^1 and R^2
20 includes, for example, benzyl, phenetyl, and
tolylmethyl.

 The amino group represented by R^1 and R^2
include, for example, acetylamino, diethylamino,
diethylamino, and amino.

25 The alkoxy group represented by R^1 and R^2

1 includes, for example, methoxy, ethoxy, and propoxy.

Of the above, the substituents preferred as R² are a chlorine atom, a bromine atom, methyl, ethyl, i-propyl, t-butyl, sec-amyl, texyl, ethoxymethyl, 5 ethoxyethyl, chloromethyl, hydroxymethyl, aminomethyl, dimethyl-aminomethyl, and benzyl. The substituents preferred as R¹ are a chlorine atom, methyl, ethyl, i-propyl, t-butyl, amyl, texyl, hydroxyl, chloromethyl, hydroxymethyl, benzyl, and cyclohexyl.

10 As A, the monovalent group substituted or unsubstituted aralkyl group includes, for example, benzyl, p-methoxybenzyl, p-N,N-dimethylaminobenzyl, p-pyrrolidinobenzyl, p-methylbenzyl, p-hydroxybenzyl, p-chlorobenzyl, 3,5-dichloro-4-hydroxybenzyl, 3-methyl-5-15 t-butyl-4-hydroxybenzyl, o,p-dimethylbenzyl, 3,5-dimethyl-4-hydroxybenzyl, 2-hydroxy-3-t-butyl-5-methylbenzyl, and naphthylmethyl.

The monovalent group substituted or unsubstituted alkyl group includes, for example, 20 methyl, ethyl, i-propyl, N,N-dimethylaminomethyl, N-benzylaminomethyl, methoxymethyl, ethoxymethyl, hydroxymethyl, methoxycarbonylethyl, methoxycarbonylmethyl, ethoxycarbonylethyl, and diethyl phosphonatomethyl.

25 The monovalent group substituted amino group includes, for example, methylamino, dimethylamino,

1 diethylamino, acetylamino, phenylamino, diphenylamino,
and triazinylamino.

The divalent group alkylidene group includes,
for example, methylene, ethylidene, propylidene, and
5 butylidene.

The divalent group aralkylidene group
includes, for example, benzylidene, p-
methylbenzylidene, and p-dimethylaminobenzylidene.

Of the above, preferred groups as A are a
10 monovalent aralkyl group, a divalent alkylidene group
or aralkylidene group, and a trivalent methine group.
Particularly preferred groups are a monovalent aralkyl
group and a divalent alkylidene group.

Of the reducing agents represented by Formula
15 (I), examples of preferred reducing agents are set out
below, but are by no means limited to these.

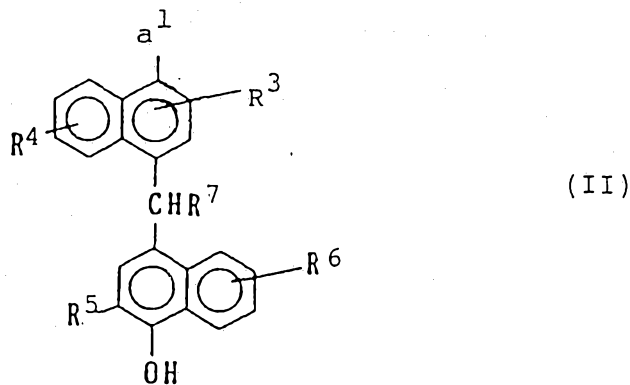
They include 2,4-dimethyl-6-t-butylphenol, 2-
methyl-4-i-propyl-6-t-butylphenol, 2,6-di-t-butyl-4-
dimethylaminophenol, 2,6-di-t-butyl-4-
20 hydroxymethylphenol, 2-t-butyl-6-benzyl-4-
methylphenol, 2,6-di-t-butyl-4-o-tolylmethylphenol,
2,6-di-t-butyl-4-benzylphenol, 2-t-butyl-4-(p-
methoxybenzyl)-5-methylphenol, 2,6-dimethyl-4-(α -
naphthylmethyl)phenol, 2,6-di-t-butyl-4-(2-hydroxy-3-t-
25 butyl-5-methylbenzyl)phenol, 2-t-butyl-4-(p-
chlorobenzyl)-6-cyclohexylphenol, 2-t-butyl-4-(2-

- 1 hydroxy-3,5-dimethylbenzyl)-5-methylphenol, 2-t-butyl-4-benzyl-6-propargylphenol, 2,6-di-t-butyl-4-(3,5-dichloro-4-hydroxybenzyl)phenol, 2,6-di-t-butyl-4-(3,5-dimethyl-4-hydroxybenzyl)phenol, 2,6-ditexyl-4-(4-
- 5 hydroxybenzyl)phenol, 2-texyl-4-benzyl-5-methylphenol, 2-allyl-4-benzyl-5-methylphenol, 2-texyl-4-(p-chlorobenzyl)-5-allylphenol, 2-chloro-4-dimethylaminomethylphenol, 2,6-di-i-propyl-4-diethylaminophenol, 2-t-butyl-4-(2-hydroxy-3-t-butyl-5-
- 10 methylbenzyl)phenol, 4,4'-methylenebis(2,6-di-t-butylphenol), 4,4'-methylenebis(2-t-butyl-5-methylphenol), 4,4'-methylenebis(2-t-butyl-6-methylphenol), 4,4'-methylenebis(2-texyl-6-methylphenol), 4,4'-methylenebis(2-cyclohexyl-6-
- 15 methylphenol), 4,4'-methylenebis(2-cyclohexyl-6-t-butylphenol), 4,4'-ethylidenebis(2,6-di-t-butylphenol), 4,4'-ethylidenebis(2-t-butyl-6-methylphenol), 4,4'-ethylidenebis(2-cyclohexyl-6-methylphenol), 4,4'-ethylidenebis(2-texyl-6-
- 20 methylphenol), 4,4'-propylidenebis(2,6-di-t-butylphenol), 4,4'-butylidenebis(2-t-butyl-6-methylphenol), 4,4'-butylidenebis(2-texyl-6-methylphenol), 4,4'-butylidenebis(2-cyclohexyl-6-methylphenol), bis(3,5-di-t-butyl-4-
- 25 hydroxyphenyl)phenylmethane, bis(3,5-di-t-butyl-4-hydroxyphenyl)(4-methoxyphenyl)methane, bis(3,5-di-t-

1 butyl-4-hydroxyphenyl)(4-dimethylaminophenyl)methane,
tris(3,5-di-t-butyl-4-hydroxyphenyl)methane, bis(3-t-
butyl-4-hydroxy-5-methylphenyl)phenylmethane.

Of these, particularly preferred reducing
5 agents are 2,6-di-t-butyl-4-o-tolyltrimethylphenol,
2,6-di-t-butyl-4-benzylphenol, 2,6-di-t-butyl-4-(2-
hydroxy-3-t-butyl-5-methylbenzyl)phenol, 2,6-di-t-
butyl-4-(3,5-dichloro-4-hydroxybenzyl)phenol, 2-t-
butyl-4-(2-hydroxy-3,5-dimethylbenzyl)-5-methylphenol,
10 4,4'-methylenebis(2,6-di-t-butylphenol), 4,4'-
methylenebis(2-t-butyl-5-methylphenol), 4,4'-
methylenebis(2-t-butyl-6-methylphenol), 4,4'-
ethylidenebis(2,6-di-t-butylphenol), 4,4'-
ethylidenebis(2-t-butyl-6-methylphenol), 4,4'-
15 propylidenebis(2,6-di-t-butylphenol), 4,4'-
butylidenebis(2-cyclohexyl-6-methylphenol), bis(3,5-di-
t-butyl-4-hydroxyphenyl)phenylmethane, bis(3,5-di-t-
butyl-4-hydroxyphenyl)(4-methoxyphenyl)methane,
bis(3,5-di-t-butyl-4-hydroxyphenyl)(4-
20 dimethylaminophenyl)methane, and tris(3,5-di-t-butyl-4-
hydroxyphenyl)methane.

As the reducing agent that turns into the
light-absorbing organic compound as a result of
oxidation-reduction reaction, the compound represented
25 by the following Formula (II) can also be used in the
image forming medium of the present invention.



In the above Formula (II), R^5 represents a hydrogen atom, an alkyl group, a cycloalkyl group, or an aralkyl group; R^3 , R^4 and R^6 each independently represent a hydrogen atom, a halogen atom, an alkyl group, an amino group, an aryl group, an aralkyl group, an alkoxy group, a nitro group, an acyl group, or a cyano group; R^7 represents a hydrogen atom, a substituted or unsubstituted alkyl group, or a substituted or unsubstituted aryl group; and a^1 represents a hydrogen atom, a hydroxyl group, a halogen atom, a substituted or unsubstituted alkyl group, a cycloalkyl group, an alkoxy group, or a substituted or unsubstituted amino group.

15

20 The halogen atom represented by a^1 , R^3 , R^4 and R^6 in the above Formula (II) includes a fluorine atom, a chlorine atom, a bromine atom, and an iodine atom.

The alkyl group represented by a^1 , R^3 , R^4 , R^5 , R^6 and R^7 may preferably be a substituted or

25 unsubstituted straight-chain or branched alkyl group having 1 to 18 carbon atoms, including, for example, a

1 straight-chain or branched hydrocarbon group such as
methyl, ethyl, propyl, i-propyl, butyl, t-butyl, amyl,
i-amyl, hexyl, heptyl, octyl, nonyl, dodecyl, or
stearyl; a straight-chain or branched alkoxyalkyl
5 group such as methoxyethyl, ethoxyethyl, ethoxypropyl,
ethoxybutyl, propoxybutyl, i-propoxypentyl, t-
butoxyethyl, or hexyloxybutyl; a hydroxylalkyl group
such as hydroxymethyl, hydroxyethyl, hydroxypropyl,
hydroxybutyl, hydroxyhexyl, or hydroxyheptyl; an
10 aminoalkyl or alkylaminoalkyl group such as
aminomethyl, dimethylaminomethyl, aminoethyl,
dimethylaminoethyl, diethylaminoethyl,
morpholinoethyl, piperidinoethyl, aminopropyl,
diethylaminopropyl, dipropylaminoethyl, aminobutyl, or
15 morpholinobutyl.

The cycloalkyl group represented by a¹, R³ and
R⁵ may preferably be a substituted or unsubstituted
cycloalkyl group having 5 to 18 carbon atoms,
including, for example, cyclopentyl, cyclohexyl,
20 cycloheptyl, cyclooctyl, methylcyclohexyl,
dimethylcyclohexyl, and ethylcyclohexyl.

The amino group represented by a¹, R³, R⁴ and
R⁶ may preferably be a substituted or unsubstituted
amino group, including, for example, amino,
25 acetylamino, methylamino, dimethylamino, diethylamino,
pyrrolidino, morpholino, benzenesulfonamido,

1 toluenesulfonamido, dipropylamino, and dibutylamino.

The aryl group represented by R^3 , R^4 , R^6 and R^7 may preferably be a substituted or unsubstituted aryl group having 6 to 16 carbon atoms, including, for
5 example, phenyl, naphthyl, anthryl, phenanthryl, tolyl, xylyl, cumenyl, mesityl, chlorophenyl, methoxyphenyl, and fluorophenyl.

The alkoxy group represented by R^3 , R^4 , R^6 , R^7 and a^1 , may preferably be a substituted or
10 unsubstituted alkoxy group having 1 to 18 carbon atoms, including, for example, methoxy, ethoxy, propoxy, i-propoxy, and butoxy.

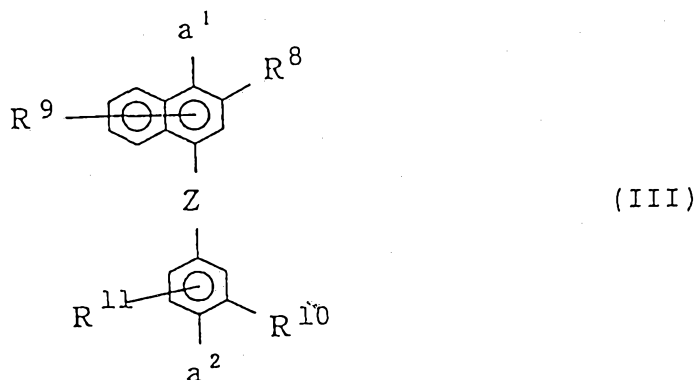
The aralkyl group represented by R^3 , R^4 , R^5 , R^6 and R^7 may preferably be a substituted or
15 unsubstituted aralkyl group having 7 to 19 carbon atoms, including, for example, benzyl, phenethyl, benzhydryl, trityl, phenylpropyl, naphthylmethyl, chlorobenzyl, dichlorobenzyl, methoxybenzyl, and methylbenzyl.

20 The acyl group represented by R^3 , R^4 and R^6 includes acetyl and propionyl.

Examples of the compound represented by Formula (II) having the above substituent include 4,4'-methylenebis(2-methyl-1-naphthol), 4,4'-methylenebis(2-ethyl-1-naphthol), 4,4'-methylenebis(2-t-butyl-1-naphthol), 4,4'-methylenebis(2-cyclohexyl-1-naphthol),
25

1 4,4'-methylenebis(2-t-butyl-6-methyl-1-naphthol), 4,4'-
methylenebis(2,6-diethyl-1-naphthol), 4,4'-
methylenebis(2-benzyl-1-naphthol), 4,4'-methylenebis(2-
t-butyl-8-methyl-1-naphthol), 4,4'-methylenebis(2-
5 methyl-5-chloro-1-naphthol), 4,4'-methylenebis(2-
methyl-8-dimethylamino-1-naphthol), 4,4'-
methylenebis(2-methyl-5-benzyl-1-naphthol), 4,4'-
methylenebis(2-methyl-5-methoxy-1-naphthol), 4,4'-
methylenebis(2-methyl-5-phenyl-1-naphthol), 4-(3'-
10 cyclohexyl-4'-hydroxynaphthyl)methyl-2-methyl-1-
naphthol, 4-(3'-t-butyl-4'-hydroxynaphthyl)methyl-2-
methyl-1-naphthol, 4-(3'-cyclohexyl-4'-
hydroxynaphthyl)methyl-2-t-butyl-1-naphthol, 4,4'-
benzylidenebis(2-methyl-1-naphthol), 4,4'-
15 benzylidenebis(2-t-butyl-1-naphthol), 4,4'-
ethylidenebis(2-methyl-1-naphthol), 4,4'-
ethylidenebis(2-t-butyl-1-naphthol), and bis(4-hydroxy-
3-methylnaphthyl)tolylmethane.

As another reducing agent that turns into the
20 light-absorbing organic compound as a result of
oxidation-reduction reaction, the compound represented
by the following Formula (III) can also be used in the
image forming medium of the present invention.



In the above Formula (III), R^8 , R^9 , R^{10} and R^{11} each independently represent a substituent selected from the group consisting of a hydrogen atom, a halogen atom, a substituted or unsubstituted alkyl group, a cycloalkyl group, an alkoxy group, a substituted or unsubstituted aralkyl group, a substituted or unsubstituted aryl group, a substituted or unsubstituted amino group, a nitro group, and an acyl group; Z represents a divalent group; and a^1 and a^2 each represent a substituent selected from the group consisting of a hydrogen atom, a hydroxyl group, a halogen atom, a substituted or unsubstituted alkyl group, a cycloalkyl group, an alkoxy group, and a substituted or unsubstituted amino group, provided that at least one of a^1 and a^2 is a hydroxyl group.

The halogen atom represented by R^8 , R^9 , R^{10} , R^{11} , a^1 and a^2 includes a fluorine atom, a chlorine atom, a bromine atom, and an iodine atom.

The alkyl group represented by R^8 , R^9 , R^{10} , R^{11} , a^1 and a^2 may preferably be a straight-chain or

1 branched alkyl group having 1 to 18 carbon atoms,
including, for example, methyl, ethyl, propyl, i-
propyl, butyl, t-butyl, i-butyl, amyl, i-amyl, sec-
amyl, hexyl, heptyl, octyl, nonyl, dodecyl, and
5 stearyl. The substituted alkyl group may preferably
include an alkoxyalkyl group having 2 to 18 carbon
atoms, a halogenoalkyl group having 1 to 18 carbon
atoms, a hydroxyalkyl group having 1 to 18 carbon
atoms, and an aminoalkyl group having 1 to 18 carbon
10 atoms, specifically including, for example,
methoxyethyl, ethoxyethyl, ethoxypropyl, ethoxybutyl,
propoxybutyl, i-propoxypentyl, t-butoxyethyl,
hexyloxybutyl, chloromethyl, chloroethyl, bromoethyl,
chloropropyl, chlorobutyl, chlorohexyl, chlorooctyl,
15 hydroxymethyl, hydroxyethyl, hydroxypropyl,
hydroxybutyl, hydroxypentyl, hydroxyhexyl,
hydroxyheptyl, aminomethyl, acetylaminomethyl,
dimethylaminomethyl, aminoethyl, acetylaminoethyl,
dimethylaminoethyl, diethylaminoethyl, morpholinoethyl,
20 piperidinoethyl, diethylaminopropyl,
dipropylaminoethyl, aminopropyl, acetylaminopropyl,
aminobutyl, and morpholinobutyl.

The aryl group represented by R^8 , R^9 , R^{10} and
 R^{11} includes, for example, phenyl, naphthyl, anthryl,
25 and phenanthryl. The substituted aryl group includes,
for example, tolyl, xylyl, cumenyl, mesityl,

1 chlorophenyl, methoxyphenyl, and fluorophenyl.

The aralkyl group represented by R^8 , R^9 , R^{10} and R^{11} includes, for example, benzyl, phenethyl, benzhydryl, trityl, phenylpropyl, and naphthylmethyl.

5 The substituted aralkyl group includes, for example, chlorobenzyl, dichlorobenzyl, methoxybenzyl, and methylbenzyl.

The cycloalkyl group represented by R^8 , R^9 , R^{10} , R^{11} , a^1 and a^2 includes, for example, a
10 cycloalkyl group with a ring of 5, 6 or 7 members, which may be substituted with an alkyl group.

The alkoxy group represented by R^8 , R^9 , R^{10} , R^{11} , a^1 and a^2 includes, for example, methoxy, ethoxy, propoxy, butoxy, i-propoxy, benzyloxy, and 2-
15 phenylethoxy.

The substituted or unsubstituted amino group represented by a^1 and a^2 includes, for example, amino, acetylamino, methylamino, isopropylamino, dimethylamino, phenylamino, diethylamino,
20 cyclopentylamino, cyclopentylmethylamino, cyclohexylamino, piperidino, and pyrrolidino.

Z represents a divalent group, and is exemplified by an alkylene group and an aralkylene group. Specifically, it preferably includes
25 methylene, ethylidene, propylidene, benzylidene, cinnamylidene, p-hydroxybenzylidene, p-

1 methylbenzylidene, and p-dimethylaminobenzylidene.

Of the compound represented by the above
Formula (III), examples of particularly preferred
compounds are set out below, but the reducing agent
5 used in the present invention is by no means limited
to these.

Examples of the compound represented by
Formula (III) include 2-methyl-4-(3,5-dimethyl-4-
hydroxyphenyl)methyl-1-naphthol, 2-methyl-4-(3,5-di-t-
10 butyl-4-hydroxyphenyl)methyl-1-naphthol, 2-methyl-4-
(hydroxyphenyl)methyl-1-naphthol, 2-methyl-4-p-
tolylmethyl-1-naphthol, 2-methyl-4-benzyl-1-naphthol,
2-t-butyl-4-(4-hydroxyphenyl)methyl-1-naphthol, 2-
methyl-4-(3,5-dichloro-4-hydroxyphenyl)methyl-1-
15 naphthol, 2-ethyl-4-(3,5-di-t-butyl-4-
hydroxyphenyl)methyl-1-naphthol, 2-methyl-4-(3,5-
dimethoxy-4-hydroxyphenyl)methyl-1-naphthol, 2-methyl-
4-(3-methyl-4-hydroxyphenyl)methyl-1-naphthol, 2-t-
butyl-4-(3-t-butyl-4-hydroxyphenyl)methyl-1-naphthol,
20 2,6-di-t-butyl-4- α -naphthylmethylphenol, 2,6-di-t-
butyl-4-methoxynaphthylmethylphenol, 2-methyl-4-(3-
chloro-4-hydroxyphenyl)methyl-1-naphthol, 2-methyl-4-
(4-dimethylaminophenyl)methyl-1-naphthol, 2-ethyl-4-
diphenylmethyl-1-naphthol, 2-methyl-4-(3-cyclohexyl-4-
25 hydroxyphenyl)-methyl-1-naphthol, 2-methyl-4-(3-phenyl-
4-hydroxyphenyl)methyl-1-naphthol, 2-methyl-4-(3-t-

1 butyl-4-hydroxy-5-methylphenyl)methyl-1-naphthol, and
2-methyl-4-benzyl-6-methyl-1-naphthol.

Of the above reducing agents of Formulas (I),
(II) and (III), two or more ones may be used in
5 combination.

In addition to the above reducing agents,
leuco compounds of coloring matters that can be
reduced can be used as the reducing agent that turns
into the light-absorbing organic compound. Preferred
10 leuco compounds include, those of, for example, azo
dyes, azomethine dyes, triarylmethane dyes, xanthene
dyes, azine dyes, indigoid dyes, formazan dyes, nitro
dyes, nitroso dyes, and azoxy dyes. Particularly
preferred are leuco compounds of azomethine dyes,
15 triarylmethane dyes, xanthene dyes, azine dyes, and
indigoid dyes. To further improve the stability of
these leuco compounds, these can also be used in the
form in which the hydroxyl group or amino group has
been acylated or sulfonated. Preferred examples of
20 the leuco compounds include, for example, α -benzoyl- α -
(p-diethylaminoanilino)acetanilide, α -benzoyl- α -(p-
diethylamino-o-methyl-anilino)aceto-o-chloroanilide, α -
benzoyl- α -(p-dimethylaminoanilino)aceto-o-
methoxyanilide, Crystal Violet Hydrol, 9-phenyl-2,7-
25 dichloro-3,6-dihydroxyxanthene, 9-phenyl-2,4,5,7-
tetrachloro-3,6-dihydroxyxanthene, 9-phenyl-4,5-

1 dimethyl-3,6-dihydroxyxanthene, and 9-phenyl-3-
diethylamino-6-hydroxy-7-chloroxanthene.

The reducing agent participating in the case
that the oxidized product produced as a result of the
5 oxidation-reduction reaction is further react with a
coupler to produce the light-absorbing organic
compound, may include, for example, secondary color
developing agents. Preferred secondary color
developing agents include, for example, p-
10 aminophenols, p-phenylenediamines, and o-aminophenols.

Also usable as the secondary color developing
agent are hydrazines as disclosed in Japanese
Unexamined Patent Publication No. 56-27132,
sulfonamidophenols as disclosed in U.S. Patent No.
15 4,021,240, and also a compound capable of producing an
aromatic primary amine as a result of heating, as
disclosed in Japanese Unexamined Patent Publication
No. 59-53831. Examples of the secondary color
developing agent that can be preferably used in the
20 present invention include 4-amino-N,N-diethylaniline,
2-amino-5-diethylaminotoluene, 4-amino-N,N-diethyl-3-
(β -hydroxyethyl)aniline, 4-amino-N,N-bis(β -
hydroxyethyl)-3-methylaniline, p-aminophenol, p-amino-
o-cresol, o-aminophenol, and o-amino-p-cresol. These
25 may be used as they are, or may be used in the form of
salts such as a hydrochloride, a sulfate, a phosphate,

1 a p-toluenesulfonate, a benzenesulfonate, and a naphthalenedisulfonate.

The coupler may preferably include α -acylacetamides, pyrazolones, phenols, and naphthols.

5 These are described in "SHASHIN NO KAGAKU (Chemistry of Photography)", First Edition, Shashin Kogyo Shuppansha, pp.278-282, or T.H. James, "The Theory of the Photographic Process", Fourth Edition, Macmillan Publishing Co., Inc., pp.353-361.

10 Examples of the coupler include benzoylacetanilide, benzoylaceto-o-methoxyanilide, benzoylaceto-o-chloroanilide, 1-phenyl-3-(4'-nitrobenzamido)-5-pyrazolone, 1-phenyl-3-[m-(p-t-amyphenoxy)benzamido]-5-pyrazolone, 2-chloro-1-
15 naphthol, and 5-isopropyl-o-cresol. Indazolones or cyanoacetyls can also be used as the coupler.

A reducing agent that does not turn into the light-absorbing organic compound as a result of the oxidation-reduction reaction may also be contained in
20 the image forming medium of the present invention so long as the object of the present invention may not be hindered.

The reducing agent utilizable as the reducing agent that does not turn into the light-absorbing
25 organic compound as a result of the oxidation-reduction reaction but can be contained in the image

1 forming medium of the present invention includes, for
example, phenols, hydroquinones, catechols, p-
aminophenols, 3-pyrazolidones, resorcins, pyrogallols,
m-aminophenols, m-phenylenediamines, 5-pyrazolones,
5 alkylphenols, alkoxyphenols, naphthols,
aminonaphthols, naphthalenediols, alkoxy-naphthols,
hydrazines, hydrazones, hydroxycuromane,
hydroxycoumarans, sulfonamide phenols, aminonaphthols,
ascorbic acids, hydroxyindanes, and orthobisphenols.
10 Leuco bases obtained by reduction of coloring matters
can also be used as the reducing agent.

The photopolymerization initiator used in the
image forming medium of the present invention
includes, for example, carbonyl compounds, sulfur
15 compounds, halogen compounds, photopolymerization
initiators of redox type, and peroxide initiators
sensitized with a dye such as pyrylium.

Specifically, the carbonyl compounds include
diketones as exemplified by benzyl, 4,4'-
20 dimethoxybenzyl, diacetyl, and camphorquinone;
benzophenones as exemplified by 4,4'-
bis(diethylamino)benzophenone, and 4,4'-
dimethoxybenzophenone; acetophenones as exemplified
by acetophenone, and 4-methoxyacetophenone; benzoin
25 alkyl ethers; thioxanthenes as exemplified by 2-
chlorothioxanthone, 2,4-dichlorothioxanthone, 2,4-

1 diethylthioxanthone, and thioxanthone-3-carboxylic
acid- β -methoxy ethyl ester; chalcones and
styrylketones having a dialkylamino group; and
cumarines as exemplified by 3,3'-carbonylbis(7-
5 methoxycumarine), and 3,3'-carbonylbis(7-
diethylaminocumarine).

The sulfur compounds include disulfides as
exemplified by dibenzothiazolyl sulfide, and
decylphenyl sulfide.

10 The halogen compounds include, for example,
carbon tetrabromide, quinolinesulfonyl chloride, and S-
triazines having a trihalomethyl group.

The photopolymerization initiators of redox
type include those used in combination of a trivalent
15 iron ionic compound (as exemplified by ferric ammonium
citrate) with a peroxide, and those used in
combination of a photoreducing coloring matter such as
riboflavin or Methylene Blue with a reducing agent
such as triethanolamine or ascorbic acid.

20 In the photopolymerization initiator described
above (including the sensitizer), two or more
photopolymerization initiators can also be used in
combination to obtain a more efficient
photopolymerization reaction.

25 Such combination of the photopolymerization
initiators includes a combination of chalcones having

1 a dialkylamino group and styrylketones or cumarins,
with S-triazines having a trihalomethyl group or
camphorquinone.

In the image forming medium of the present
5 invention, preferably used are photopolymerization
initiators having a photosensitive wavelength region
of from 370 to 520 nm.

In the present invention, the
photopolymerization initiator to be used is required
10 to be appropriately selected depending on the light-
absorption characteristics of the light-absorbing
organic compound produced as a result of the oxidation-
reduction reaction of the reducing agent. Examples of
such combination of the reducing agent and
15 photopolymerization initiator are set out below.

When, for example, 4,4'-propylidenebis(2,6-di-
t-butylphenol), 4,4'-butylidenebis(3-methyl-6-t-
butylphenol), 4,4'-methylenebis(2,6-di-t-butylphenol),
4,4'-methylenebis(2-t-butyl-6-methylphenol), 2,6-di-t-
20 butyl-4-(3,5-dimethyl-4-hydroxyphenyl)methylphenol, 2-
methyl-4-(3,5-dimethyl-4-hydroxyphenyl)methyl-1-
naphthol, etc. are used as the reducing agent,
preferred are photopolymerization initiators having
sensitivity at 380 nm to 420 nm, as exemplified by 2-
25 chlorothioxanthone, 2-methylthioxanthone, 2,4-
dimethylthioxanthone, 2,4-diethylthioxanthone, 3,3'-

1 carbonylbis(7-methoxycumarine), 2,4,6-
trimethylbenzoyldiphenyl-phosphine oxide, and benzyl.

When, for example, 2,6-di-t-butyl-4-(2-hydroxy-
3-t-butyl-5-methylbenzyl)phenol, 2,6-di-t-butyl-4-
5 benzylphenol, 2,6-di-t-butyl-4-o-trimethylphenol, etc.
are used as the reducing agent, preferred are
photopolymerization initiators having sensitivity at
300 mm to 380 mm, as exemplified by 1-phenyl-2-hydroxy-
2-methylpropane-1-one, 1-hydroxycyclohexyl phenyl
10 ketone, benzyl dimethyl ketal, benzophenone, and 4-
benzoyl-4'-methyl-diphenyl sulfide.

When, for example, bis(3,5-di-t-butyl-4-
hydroxyphenyl)-(4-dimethylaminophenyl)methane, 4,4'-
methylenebis(2-methyl-1-naphthol), 4,4'-methylenebis(2-
15 ethyl-1-naphthol), 4,4'-methylenebis(2-cyclohexyl-1-
naphthol), 4,4'-methylenebis(2-t-butyl-1-naphthol),
etc. are used as the reducing agent, preferred are
combinations of photopolymerization initiators having
sensitivity at 400 mm to 520 mm, as exemplified by
20 3,3'-carbonylbis(7-dimethylaminocumarine), riboflavin
tetrabutylate, or merocyanine dyes, with
trichloromethyl-S-triazine compounds.

As the polymerizable polymer precursor used in
the image forming medium of the present invention, a
25 compound having at least one reactive vinyl group in
its one molecule can be utilized.

1 The reactive vinyl group in these compounds
includes substituted or unsubstituted vinyl groups
having polymerization reactivity, as exemplified by
styrene type vinyl groups, acrylic acid vinyl type
5 groups, methacrylic acid type vinyl groups, allyl type
vinyl groups, and vinyl ethers, as well as ester vinyl
groups such as vinyl acetate.

Examples of the polymerizable polymer
precursor satisfying such conditions are as follows.

10 They include, for example;

 monovalent monomers such as styrene,
methylstyrene, chlorostyrene, bromostyrene,
methoxystyrene, dimethylaminostyrene, cyanostyrene,
nitrostyrene, hydroxystyrene, aminostyrene,
15 carboxystyrene, acrylic acid, methyl acrylate, ethyl
acrylate, cyclohexyl acrylate, acrylamide, methacrylic
acid, methyl methacrylate, ethyl methacrylate, propyl
methacrylate, butyl methacrylate, phenyl methacrylate,
cyclohexyl methacrylate, vinyl pyridine, N-
20 vinylpyrrolidone, N-vinylimidazole, 2-vinylimidazole,
N-methyl-2-vinylimidazole, propyl vinyl ether, butyl
vinyl ether, isobutyl vinyl ether, β -chloroethyl vinyl
ether, phenyl vinyl ether, p-methylphenyl vinyl ether,
and p-chlorophenyl vinyl ether;

25 divalent monomers such as divinylbenzene,
distyryl oxalate, distyryl malonate, distyryl

1 succinate, distyryl glutarate, distyryl adipate,
distyryl maleate, distyryl fumarate, distyryl β, β' -
dimethylglutarate, distyryl 2-bromoglutarate, distyryl
 α, α' -dichloroglutarate, distyryl terephthalate, oxalic
5 acid di(ethyl acrylate), oxalic acid di(methyl ethyl
acrylate), malonic acid di(ethyl acrylate), malonic
acid di(methyl ethyl acrylate), succinic acid di(ethyl
acrylate), glutaric acid di(ethyl acrylate), adipic
acid di(ethyl acrylate), maleic acid di(diethyl
10 acrylate), fumaric acid di(ethyl acrylate), β, β' -
dimethylglutaric acid di(ethyl acrylate),
ethylenediacrylamide, propylenediacrylamide, 1,4-
phenylenediacrylamide, 1,4-phenylenebis(oxyethyl
acrylate), 1,4-phenylenebis(oxymethyl ethyl acrylate),
15 1,4-bis(acryloyloxyethoxy)cyclohexane, 1,4-
bis(acryloyloxymethylethoxy)cyclohexane, 1,4-
bis(acryloyloxyethoxycarbamoyl)benzene, 1,4-
bis(acryloyloxymethylethoxycarbamoyl)benzene, 1,4-
bis(acryloyloxyethoxycarbamoyl)cyclohexane,
20 bis(acryloyloxyethoxycarbamoylcyclohexyl)methane,
oxalic acid di(ethyl methacrylate), oxalic acid
di(methyl ethyl methacrylate), malonic acid di(ethyl
methacrylate), malonic acid di(methyl ethyl
methacrylate), succinic acid di(ethyl methacrylate),
25 succinic acid di(methyl ethyl methacrylate), glutaric
acid di(ethyl methacrylate), adipic acid di(ethyl

1 methacrylate), maleic acid di(ethyl methacrylate),
fumaric acid di(ethyl methacrylate), fumaric acid
di(methyl ethyl methacrylate), β,β' -dimethylglutaric
acid di(ethyl methacrylate), 1,4-phenylenebis(oxyethyl
5 methacrylate), and 1,4-
bis(methacryloyloxyethoxy)cyclohexane
acryloyloxyethoxyethyl vinyl ether;

trivalent monomers such as pentaerythritol
triacrylate, pentaerythritol trimethacrylate,
10 pentaerythritol tri(hydroxystyrene), cyanuric acid
triacrylate, cyanuric acid trimethacrylate, 1,1,1-
trimethylolpropane triacrylate, 1,1,1-
trimethylolpropane trimethacrylate, cyanuric acid
tri(ethyl acrylate), 1,1,1-trimethylolpropane
15 tri(ethylacrylate), dipentaerythritol hexaacrylate,
cyanuric acid tri(ethyl vinyl ether), a condensate of
a reaction product between 1,1,1-trimethylolpropane
and three-fold moles of toluenediisocyanate, with
hydroxyethyl acrylate, and a condensate of a reaction
20 product between 1,1,1-trimethylolpropane and three-
fold moles of hexanediisocyanate, with p-
hydroxystyrene; and

tetravalent monomers such as ethylene-
tetraacrylamide, and propylenetetraacrylamide. Two or
25 more of these polymerizable polymer precursors may be
used in combination.

1 For the purpose of improving film formation
properties and dispersion, the image forming layer 1
may preferably be incorporated with a binder, which
may be appropriately contained.

5 The binder includes, for example;

cellulose esters such as nitrocellulose,
cellulose phosphate, cellulose sulfate, cellulose
acetate, cellulose propionate, cellulose butyrate,
cellulose myrystate, cellulose palmitate, cellulose
10 acetate propionate, and cellulose acetate butyrate;

cellulose ethers such as methyl cellulose,
ethyl cellulose, propyl cellulose, and butyl
cellulose;

vinyl resins such as polystyrene, polyvinyl
15 chloride, polyvinyl acetate, polyvinyl butyral,
polyvinyl acetal, polyvinyl alcohol, and polyvinyl
pyrrolidone;

copolymer resins such as a styrene/butadiene
copolymer, a styrene/acrylonitrile copolymer, a
20 styrene/butadiene/acrylonitrile copolymer, and a vinyl
chloride/vinyl acetate copolymer;

acrylic resins such as polymethyl
methacrylate, polymethyl acrylate, polybutyl acrylate,
polyacrylic acid, polymethacrylic acid,
25 polyacrylamide, and polyacrylonitrile;

polyesters such as polyethylene terephthalate;

1 polyacrylate resins such as poly(4,4'-
isopropylidene, diphenylene-co-1,4-
cyclohexylenedimethylene carbonate),
poly(ethylenedioxy-3,3'-phenylene thiocarbonate),
5 poly(4,4'-isopropylidene, diphenylene carbonate-co-
terephthalate), poly(4,4'-isopropylidene, diphenylene
carbonate), poly(4,4'-sec-butylidene, diphenylene
carbonate), and poly(4,4'-isopropylidene, diphenylene
carbonate-block-oxyethylene);

10 polyamides; polyimides; epoxy resins; phenol
resins;

polyolefins such as polyethylene,
polypropylene, and chlorinated polyethylene; and
natural polymers such as gelatin.

15 In addition to these, toning agents,
antifoggants, alkali generating agents, automatic
oxidants, etc. may be optionally added in the image
forming medium of the present invention. The image
forming layer 1 may also be provided with a protective
20 layer comprising polyvinyl alcohol, polyethylene
terephthalate or the like so that the polymerization
reaction can be prevented from its inhibition due to
oxygen and any damages ascribable to an external force
can be prevented.

25 In the image forming medium of the present
invention, the components described above may

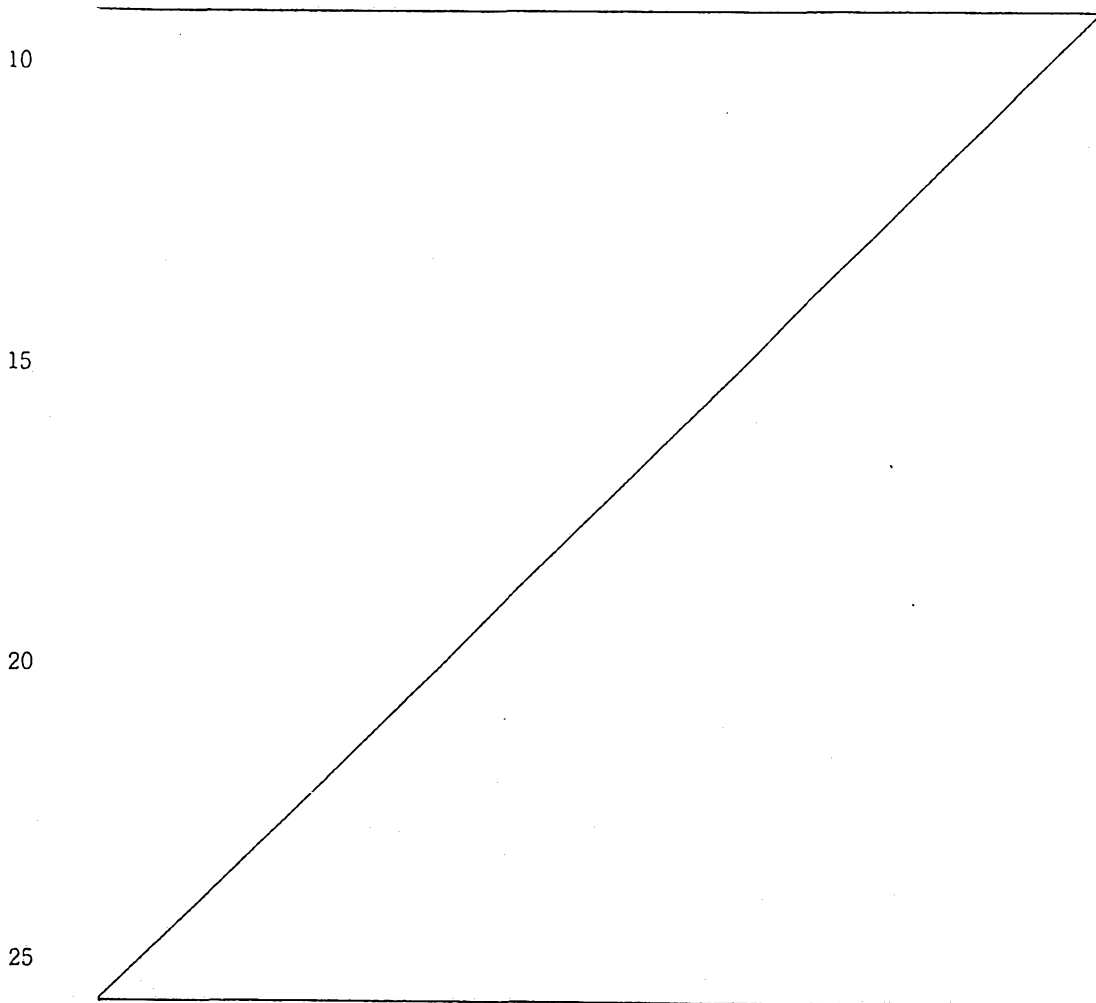
1 preferably be used in the proportion as follows:

The organic silver salt may preferably be contained in the image forming layer 1 in an amount of from 0.3 to 30 g/m², more preferably from 0.7 to 15
5 g/m², and particularly preferably from 1.2 to 8 g/m².

The silver halide is preferably contained in an amount of from 0.001 mole to 2 moles, more preferably from 0.05 mole to 1 mole, and still more preferably from 0.05 mole to 0.4 mole, per 1 mole of
10 the organic silver salt. The reducing agent is preferably contained in an amount of from 0.05 mole to 3 moles, and more preferably from 0.2 mole to 1.3 mole, per 1 mole of the organic silver salt. The polymerization initiator is preferably contained in an
15 amount of from 0.1 part by weight to 30 parts by weight, and more preferably from 0.5 part by weight to 10 parts by weight, based on 100 parts by weight of the polymerizable polymer precursor. The polymerization initiator is preferably contained in an
20 amount of from 0.01 mole to 10 moles, and more preferably from 0.5 mole to 3 moles, per 1 mole of the reducing agent.

The amount of the binder optionally contained in the image forming layer 1 may preferably be
25 contained in a proportion of from 0 to 10 parts by weight, and more preferably from 0.5 to 5 parts by

1 weight, based on 1 part by weight of the organic
silver salt. This proportion also applies in respect
of the photosensitive layer 11 described later. The
amount of the binder also optionally contained in the
5 polymerizing layer 12 described later may preferably
be contained in a proportion of from 0 to 10 parts by
weight based on 1 part by weight of the polymerizable
polymer precursor.



1 The image forming medium of the present
invention can be formed by dissolving the above
components in a solvent together with a binder
appropriately used, and coating the resulting solution
5 on the support 2 such as metal foil, plastic film,
paper, baryta paper or synthetic paper, followed by
drying, or, when the strength is kept by the binder
itself, by incorporating the above essential
components into a film- or sheet-like material formed
10 by the binder.

The image forming layer 1 may preferably have
a thickness of from 0.1 μm to 2 mm, and more
preferably from 1 μm to 0.1 mm. The support 2 may
also preferably have a thickness of from about 2 μm to
15 about 3 mm.

The image forming layer 1 may be constituted
of a multi-layer structure. For example, as shown in
Fig. 9, the image forming layer 1 may be constituted
of a photosensitive layer 11 and a polymerizing layer
20 12, and provided on the support 2. In this instance,
the photosensitive layer 11 contains at least the
photosensitive silver halide, organic silver salt and
reducing agent, and the polymerizing layer 12 contains
at least the polymerizable polymer precursor and
25 photopolymerization initiator. The numeral 20 denotes
a protective layer comprising polyvinyl alcohol,

1 polyethylene terephthalate or the like, which may be
optionally provided.

In instances in which an image is formed using
the image forming medium comprised of the image
5 forming layer having the multi-layer constitution, the
image is formed according to the same method as
described in relation to Figs. 1 to 3. First, as
shown in Fig. 9, in the step of imagewise exposure the
photosensitive layer 11 is imagewise exposed to light
10 in the desired form according to analog exposure or
digital exposure ($h\nu_1$). As a result, silver metal 3
is produced on the photosensitive silver halide in the
exposed area 11a. This forms a latent image. The
silver metal 3 produced serves as a catalyst for the
15 thermal reaction between the organic silver salt and
reducing agent contained in the photosensitive layer
11.

Next, in the step of heat development, the
photosensitive layer 11 in which the latent image has
20 been formed is heated. As a result, as shown in Fig.
10, the silver metal 3 selectively acts as a catalyst
at the exposed area 11a, and the organic silver salt
reacts with the reducing agent, where the organic
silver salt is reduced to a silver atom and at the
25 same time the reducing agent is formed into an
oxidized product.

1 Heating conditions in this step of heat
development are the same as the instance described in
relation to Figs. 1 to 3.

Subsequently, as shown in Fig. 11, in the step
5 of polymerization, polymerization exposure is carried
out on the whole surface from the photosensitive layer
11 side ($h\nu_2$) to bring the photopolymerization
initiator contained in the polymerizing layer 12 into
cleavage to generate a radical species. This radical
10 species causes polymerization reaction, and thus a
polymer area is formed in the polymerizing layer 12.
On that occasion, the amount of transmission of the
light of the wavelength region which the
photopolymerization initiator absorbs is different
15 between the exposed area 11a and unexposed area 11b,
and hence a difference is produced in the state of
formation of polymers, between the part 12a
corresponding to the exposed area 11a and the part 12b
corresponding to the unexposed area 11b, of the
20 polymerizing layer 12 (resulting in a higher degree of
polymerization at the part 12b corresponding to the
unexposed area 11b than the part 12a corresponding to
the exposed area 11a). A polymer image is thus
formed because of this difference.

25 An image can be formed also when, as shown in
Fig. 12, a photosensitive material 30 and a

1 polymerization material 31 are used which comprise the
photosensitive layer 11 and polymerizing layer 12
separately provided on a support 21 and on a support
2, respectively. More specifically, first the
5 photosensitive layer 11 of the photosensitive material
30 is subjected to the step of imagewise exposure and
step of heating previously described, and then the
photosensitive layer 11 and the polymerizing layer 12
of the polymerization material 31 are laid overlapping
10 each other and subjected to the step of polymerization
previously described. The polymer image can be thus
formed (Separation process).

The components that constitute the
photosensitive layer 11 and polymerizing layer 12
15 shown in Figs. 9 and 12, and the mixing proportion of
the components can be made similar to the instance of
the image forming medium constituted of the single
layer image forming layer (Fig. 1). The support 21
may also be made of the same material as the support
20 2, and there can be used, for example, metallic foil,
plastic film, paper, baryta paper, or synthetic paper.

When the image forming layer (having the
photosensitive layer 11 and polymerizing layer 12)
shown in Fig. 9 and the photosensitive layer 11 and
25 polymerizing layer 12 shown in Fig. 12 can
respectively keep their shapes as layers by their own

1 strength (for example, the binder is used), the
support 2 and the support 12 may not be used.


The photosensitive layer 11 and polymerizing
layer 12 each may preferably have a thickness of from
5 0.05 μm to 1 mm, more preferably from 0.3 μm to 30 μm ,
and particularly preferably from 0.6 μm to 10 μm .

In the image forming method of the present
invention, an image may be further formed in the
following way, utilizing the polymer image.

10 For example, a heat-diffusible coloring matter
is previously incorporated in the image forming layer
1 shown in Fig. 1 or the polymerizing layer 12 shown
in Figs. 9 and 12, and the heat-diffusible coloring
matter is transferred to an image receiving medium
15 according to the step of transfer as described below
to form an image.

Namely, as shown in Fig. 13, an image
receiving medium 7 is laminated on the image forming
layer 1 in which the polymer image has been formed,
20 followed by heating. As a result, the heat-diffusible
coloring matter the image forming medium previously
contains is diffusion-transferred to the image
receiving medium 7, corresponding with the latent
image, and thus an image comprised of the heat-
25 diffusible coloring matter is formed on the image
receiving medium (Transfer step).

1 The image formation according to the above
transfer step, in which the amount of transfer of the
heat-diffusible coloring matter can be controlled
according to the degree of polymerization (the amount
5 of transfer of the heat-diffusible coloring matter
decreases as the degree of polymerization increases),
makes it possible to readily obtain an image with
density gradation.



10 In the instance where the image forming layer
has the photosensitive layer 11 and polymerizing layer
12 (Fig. 9) and the instance of the separation
process, the image receiving medium 7 is, as shown in
Fig. 14, laminated on the polymerizing layer 12 after
the step of polymerization has been completed
15 (provided that, in the instance of the image forming
medium shown in Fig. 9, after the step of
polymerization has been completed and the
photosensitive layer 11 has been peeled), followed by
heating to an appropriate degree. As a result of the
20 heating, the heat-diffusible coloring matter present
at the part 12a having a low degree of polymerization
in the polymerizing layer 12 is selectively diffusion-
transferred, since the heat-diffusibility of the heat-
diffusible coloring matter present at the part 12b
25 having a high degree of polymerization is suppressed
in the polymerizing layer 12, compared with the heat-

1 diffusible coloring matter present at the part 12a
having a low degree of polymerization.

In the instance of the image forming medium
shown in Fig. 9 and the instance of the separation
5 process, the polymerizing layer 12 and image receiving
medium 7 are directly laminated after the
photosensitive layer 11 has been removed, but it is
also possible to carry out the thermal transfer of the
heat-diffusible coloring matter in the state that the
10 photosensitive layer 11 is provided. When the
photosensitive layer 11 is removed, the binder used in
the photosensitive layer 11 should be a binder that
enables easy peeling of the photosensitive layer 11
from the polymerizing layer 12.

15 The mechanism by which the diffusibility of
the heat-diffusible coloring matter in the polymerized
area 12b is that the molecular chain of the polymer
can be loosened with difficulty even when the
polymerized area 12b is heated, as a result of the
20 polymerization of the polymerizable polymer precursor
or, when a polyfunctional polymerizable polymer
precursor is contained, as a result of the
crosslinking thereof, and thus the heat-diffusible
coloring matter is suppressed from being diffused.

25 In the instance where the image is formed
using the heat-diffusible coloring matter, the heat-

1 diffusible coloring matter may not be incorporated in
the image forming layer 1 or polymerizing layer 12,
and instead a coloring material layer containing the
heat-diffusible coloring matter may be provided
5 between the image forming layer 1 and support 2 or
between the polymerizing layer 12 and support 2. The
image attributable to the heat-diffusible coloring
matter can also be thereby formed in the same way as
the previously described.

10 Known as an image forming method in which a
coloring matter is transferred using a dry, silver
salt type image forming medium is a method utilizing a
reducing agent to which the function of generating a
coloring matter is imparted. This known method,
15 however, involves the disadvantage that the resulting
image has so poor light-resistance and storage
stability that laminating must be carried out or an
ultraviolet absorbent must be used in a large amount.

On the other hand, according to the embodiment
20 of the present invention, having the above transfer
step, the reducing agent and the coloring matter are
separate components, and hence the coloring matter can
be arbitrarily selected, so that an image having light-
resistance, storage stability and good tone can be
25 obtained.

The heat-diffusible coloring matter may be

1 contained in an amount of from 5 to 200 parts by
weight, and more preferably from 10 to 100 parts by
weight, based on 100 parts by weight of the total sum
of the silver halide, organic silver salt, reducing
5 agent, polymerizable polymer precursor,
photopolymerization initiator and the binder
optionally contained.

In the instance where the heat-diffusible
coloring matter is contained in the polymerizing layer
10 12, the heat-diffusible coloring matter may suitably
be contained in an amount of from 5 to 60 % by weight
based on the polymerizing layer 12. In the instance
where the coloring material layer is provided, the
heat-diffusible coloring matter may preferably be
15 contained in an amount not less than 5 % based on the
coloring material layer. The coloring material layer
can also be constituted of only the heat-diffusible
coloring matter.

The heat-diffusible coloring matter used in
20 the present invention includes, for example, monoazo
dyes, thiazole dyes, anthraquinone dyes,
triallylmethane dyes, rhodamine dyes, and naphthol
dyes. The heat-diffusible coloring matter, in
general, has a larger heat-diffusibility as the
25 molecular weight becomes smaller, and also has a
smaller heat-diffusibility as the dye has more polar

1 groups as exemplified by a carboxyl group, an amino
group, a hydroxyl group, a nitro group and a sulfone
group. Hence, coloring matters having the desired
heat-diffusibility may be appropriately selected on
5 the basis of the molecular weight and polar groups,
depending on the degree of polymerization or crosslink
density and heating conditions in the image forming
medium of the present invention.

There are no particular limitations on the
10 image receiving medium used in the step of
transferring the heat-diffusible coloring matter, so
long as it enables good transfer of the heat-
diffusible coloring matter and is capable of forming a
good image. It may be a plain paper, but preferably
15 be comprised of a substrate provided thereon with an
image receiving layer so that the heat-diffusible
coloring matter may be transferred to this image
receiving layer. As the image receiving layer,
various materials can be used, as exemplified by
20 polyester resins, polycarbonate resins, polyvinyl
acetate resins, polyurethane resins, polyamide resins,
polycaprolactam resins, and polyvinyl chloride resins.

Preferred values for the heating temperature
in the transfer step may vary depending on various
25 conditions such as the type of the heat-diffusible
coloring matter and the degree of polymerization of

1 the polymer, but may range from 80 to 250°C, and preferably from 80 to 200°C.

After the above transfer step, the image forming medium may be peeled from the image receiving
5 medium. Thus, the heat-diffusible coloring matter is transferred to the image receiving medium 7 and an image 8 can be obtained on an image receiving layer 7b on a substrate 7a as shown in Fig. 15. The image obtained through the transfer step is an image having
10 a superior contrast to give an image having a superior brightness and chroma.

In the present invention, in the instance where the image is formed using the heat-diffusible coloring matter, a plurality of image forming mediums
15 (or polymerization materials) containing heat-diffusible coloring matters having colors different from each other as, e.g., yellow, magenta, cyan, and also black, may be used to form images with the respective colors, overlapping on a single image
20 receiving medium, whereby an image with multiple colors can also be formed. Such an image with multiple colors can also be formed by an image forming medium (or a polymerization material) comprising a single support having thereon an image receiving layer
25 (or a polymerizing layer, or a coloring material layer) containing heat-diffusible coloring matters

1 with different colors (for example, yellow, magenta,
cyan, and also black) in the state separated into
regions for the respective colors. Namely, the heat-
diffusible coloring matters may be successively
5 transferred from the required color regions and the
images with the respective colors may be overlapped
each other, so that the image with multiple colors can
be formed.

The polymer image can also be separated to the
10 image receiving medium side and support side,
utilizing the difference in adhesion between the area
sufficiently polymerized and the area at which no
polymerization has proceeded (Peeling-apart).

In this instance, an image forming medium
15 comprising an image receiving medium 9 laminated on an
image forming layer 1 is used, where, after the step
of polymerization has been completed (Fig. 16), the
image receiving medium 9 is peeled from the image
forming medium (Fig. 17). As a result, the polymer
20 image is separated at the area sufficiently
polymerized and the area at which no polymerization
has proceeded, and thus a positive image and a
negative image can be obtained.

In the instance where the peeling-apart is
25 carried out in the separation process, the area
sufficiently polymerized and the area at which no

1 polymerization has proceeded are separated when the
photosensitive material 30 is peeled from the
polymerization material 31.

5 In the above peeling-apart, whether or not the
area sufficiently polymerized and the area at which no
polymerization has proceeded are separated when the
photosensitive material 30 is peeled from the
polymerization material 31 depends on how the
materials for the image receiving medium, support,
10 image forming layer, etc. are selected.

The image receiving medium 9 used in the
peeling-apart includes, for example, art paper, coated
paper, films, and metallic foil. In the step of
carrying out the peeling-apart, heating may not
15 necessarily be required, but the image forming medium
and image receiving medium may preferably be heated to
about 40°C to about 150°C to carry out the transfer.
The transfer may preferably be carried out under a
pressure of from 0.5 kg/cm² to 400 kg/cm², and
20 preferably from 1 kg/cm² to 150 kg/cm².

To note only the peeling-apart, such steps are
disclosed in Japanese Patent Publication No.
38-9663, Japanese Unexamined Patent Publication No.
49-32640, etc.

25 The method of the present invention, however,
can be said to be a superior method to the methods

1 disclosed in these, on account of the
photosensitivity, the photosensitivity wavelength
region, and the fact that image processing is
possible.

5 The polymer image may further be colored by
selectively adhering a powder such as toner, or an
ink, to the polymer image, utilizing the difference in
adhesion or the difference in hydrophilic nature (or
hydrophobic nature) between the polymerized area and
10 unpolymerized area of the polymer image. The powder
such as toner, or the ink, adhered to the polymer
image may further be transferred to an image receiving
medium such as paper. The unpolymerized area of the
polymer image may also be removed by etching to give
15 an image comprised of the polymerized area.

EXAMPLES

The present invention will be described below
in greater detail by giving Example. In the following
20 description, the "part(s)" that represents an amount
proportion is by weight unless particularly mentioned.

Example 1

Using a homomixer, a dispersion having the
following composition was prepared in a darkroom.

25 Behenic acid	2.5 parts
Silver behenate	4.5 parts

1	Silver bromide	0.7 part
	Polyvinyl butyral	10.0 parts
	(S-LEC BL-1; a product of Sekisui Chemical Co., Ltd.)	
5	Trimethylolpropane triacrylate	10.0 parts
	(NK Ester A-TMPT; a product of Shin-Nakamura Chemical Co., Ltd.)	
	Ethyl 4-dimethylaminobenzoate	0.6 part
	(KAYACURE EPA; a product of Nippon Kayaku Co., Ltd.)	
10	2,4-Diethylthioxanthone	0.4 part
	(KAYACURE DETX; a product of Nippon Kayaku Co., Ltd.)	
	4,4'-Methylenebis(2,6-di-t-butylphenol)	3.2 parts
15	Phthalazinone	0.8 part
	Xylene	60 parts
	n-Butanol	60 parts

This dispersion was coated on a polyethylene terephthalate film (hereinafter "PET film") so as to give a dried film thickness of 5 μ m. Subsequently, on the resulting coating, a polyvinyl alcohol layer (hereinafter "PVA layer") was further formed by coating to obtain an image forming medium of the present invention.

25 In respect of this image forming medium, $f(\lambda)$ and $g(\lambda)$ as shown in Figs. 4 and 5 were measured

1 according to the measuring method as previously
described, to examine the O.D values A_2 , A_3 and A_4 ,
the absorption peak wavelengths λ_3 and λ_6 , the half-
width $W_{1/2}$, $a = |\lambda_6 - \lambda_3|/W_{1/2}$ and $k = G(\lambda_3)/(A_2 - A_4)$.

5 Results obtained are shown in Table 1.

The image forming medium of the present
Example, on which a mask was laid overlapping, was
further imagewise exposed to light for 10 seconds
through a filter that does not pass the light of 400
10 nm or less, using an ultra-high-pressure mercury lamp
having an electric power of 500 W, with a distance of
60 cm from the medium. The mask was thereafter
removed, and the medium was heated for 16 seconds
using a heat-developing machine regulated at 125°C.

15 Thereafter, the filter was removed, and the
polymerization exposure was carried out for 5 seconds
using the above ultra-high-pressure mercury lamp with
a distance of 60 cm from the medium, to form a polymer
image. Subsequently, the PVA layer was removed by
20 washing with water, followed by etching with ethanol.
As a result, the polymerized area of the polymer image
remained on the PET film. In the present Example, it
was also possible to obtain the image by etching, even
when the exposure time for the polymerization exposure
25 was varied within the range of from 2 seconds to 50
seconds.

1 Example 2

A dispersion having the following composition was prepared in a darkroom.

	Palmitic acid	1.6 parts
5	Behenic acid	0.4 part
	Silver behenate	4.0 parts
	Silver iodobromide	0.9 part
	Methyl methacrylate/styrene (8/2) copolymer	12.0 parts
10	Trimethylolpropane triacrylate	4.0 parts
	(NK Ester A-TMPT; a product of Shin-Naka ara Chemical Co., Ltd.)	
	Dipentaerythritol hexaacrylate	6.5 parts
	(KAYARD DPHA; a product of Nippon Kayaku Co., 15 Ltd.)	
	p-Diethylaminobenzonitrile	0.2 part
	Benzyl dimethyl ketal	0.3 part
	(Irgacure 651; a product of Ciba Geigy Corp.)	
	α -(3,5-di-t-butyl-4-hydroxyphenyl)- α -phenylethane	2.8 parts
20	Phthalazinone	0.7 part
	Toluene	80 parts
	i-Propanol	40 parts

This dispersion was coated on a PET film so as
25 to give a dried film thickness of 8 μ m. Subsequently,
the resulting coating was laminated on an anodized

1 aluminum sheet to obtain an image forming medium of
the present invention.

In respect of this image forming medium, $f(\lambda)$
and $g(\lambda)$ were measured according to the measuring
5 method as previously described, in the state that no
lamination has been made on the aluminum sheet.
Results obtained are shown in Table 1.

The image forming medium of the present
Example was further imagewise exposed to light in the
10 same manner as Example 1. Thereafter, the medium was
heated for 8 seconds using a heat-developing machine
regulated at 130°C.

Thereafter, the filter was removed, and the
polymerization exposure was carried out for 10 seconds
15 using the same ultra-high-pressure mercury lamp as
used in the imagewise exposure, with a distance of 60
cm from the medium, to form a polymer image.

Subsequently, the PET laminate film was removed,
followed by etching with an ethanol/acetone mixed
20 solution. As a result, the polymerized area of the
polymer image remained on the aluminum sheet film. In
the present Example, it was also possible to obtain
the image by etching, even when the exposure time for
the polymerization exposure was varied within the
25 range of from 3 seconds to 20 seconds.

Example 3

1 A dispersion having the following composition was prepared in a darkroom.

	Behenic acid	2.5 parts
	Silver behenate	4.5 parts
5	Silver bromide	0.7 part
	Polymethyl methacrylate	10.0 parts
	(Dianal BR-100; a product of Mitsubishi Rayon Co., Ltd.)	
	Dipentaerythritol hexaacrylate	10.0 parts
10	(KAYARD DPHA; a product of Nippon Kayaku Co., Ltd.)	
	Ethyl 4-dimethylaminobenzoate	0.6 part
	(KAYACURE EPA, a product of Nippon Kayaku Co., Ltd.)	
15	Phthalazinone	0.8 part
	2,4-Diethylthioxanthone	0.4 part
	(KAYACURE DETX; a product of Nippon Kayaku Co., Ltd.)	
	4,4'-Methylenebis(2,6-di-t-Lutylphenol)	4.2 parts
20	MS Magenta VP	2.0 parts
	(a product of Mitsui Toatsu Chemicals Inc.)	
	Toluene	80 parts
	i-Propanol	40 parts

This dispersion was coated on a PET film so as
25 to give a dried film thickness of 5 μ m. Subsequently, on the resulting coating, a PVA layer was further

1 formed by coating to obtain an image forming medium of
the present invention.

In respect of this image forming medium, $f(\lambda)$
and $g(\lambda)$ were measured according to the measuring
5 method as previously described. Results obtained are
shown in Table 1.

The image forming medium of the present
Example was further imagewise exposed to light and
subjected to the heat development in the same manner
10 as Example 1.

Thereafter, the filter was removed, and, while
heating the medium at 80°C, the polymerization
exposure was carried out for 30 seconds using the same
ultra-high-pressure mercury lamp as used in the
15 imagewise exposure, with a distance of 60 cm from the
medium, to form a polymer image. Subsequently, the
PVA layer was removed by washing with water, and then
the exposed surface of the image forming medium and an
image receiving paper coated with polyester resin were
20 laid overlapping each other, which were then passed
through a 100°C transfer roller. Thereafter the image
receiving paper was peeled from the image forming
medium. As a result, a sharp red image corresponding
with the imagewise exposed area was formed on the
25 image receiving paper.

Example 4

1 Example 1 was repeated to prepare an image
forming medium of the present invention, except that
2.5 parts of 4,4'-methylenebis(2-t-butyl-6-
methylphenol) was used in place of the reducing agent
5 4,4'-methylenebis(2,6-di-t-butylphenol) in Example 1.

In respect of this image forming medium, $f(\lambda)$
and $g(\lambda)$ were measured according to the measuring
method as previously described. Results obtained are
shown in Table 1.

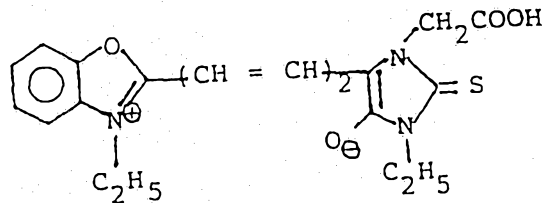
10 The image forming medium of the present
invention was further subjected to formation of a
polymer image in the same manner as Example 1,
followed by etching with ethanol. As a result, the
polymerized area of the polymer image remained on the
15 PET film. In the present Example, it was also
possible to obtain the image by etching, even when the
exposure time for the polymerization exposure was
varied within the range of from 3 seconds to 15
seconds.

20 Example 5

A solution obtained by dissolving 1.2 mg of a
sensitizing dye represented by the following formula, in
1.0 mL of N,N-dimethylformamide was added in the
dispersion prepared in the same manner as Example 1.

25

1



5

Subsequently, the resulting dispersion was coated on a PET film so as to give a dried film thickness of 5 μm. On the resulting coating, a PVA layer was further formed by coating to obtain an image forming medium of the present invention.

On this image forming medium, image writing was carried out with a He-Ne laser (wavelength: 633 nm; output: 5 mW), using a drum-scanning laser beam printer (LBPP, manufactured by Abe Sekkei).

Thereafter, the heat development and polymerization exposure were carried out in the same manner as Example 1. Subsequently, the PVA layer was removed by washing with water, followed by etching with ethanol. As a result, there was obtained an image corresponding with the irradiation with laser beams.

Example 6

Behenic acid	4 parts
AgBr	1.2 parts
Silver behenate	7 parts

25

1	Polyvinyl butyral	10 parts
	(S-LEC BL-2; a product of Sekisui Chemical Co., Ltd.)	
	Phthalazinone	0.6
5	partToluene-butanol	120 parts
	2,6-Diethyl-4-(3-cyclohexyl-4-hydroxy-5-methylbenzyl)phenol	2.5 parts

The above formulation was weighed, which was set in an ultrasonic dispersion machine and uniformly dispersed to obtain Solution A.

10	Oplas Red 330	1.8 parts
	(a product of Orient Chemical Industries Ltd.)	
	Methyl methacrylate/butyl methacrylate (8/2) copolymer	1.0 part
15	Methyl ethyl ketone	10 parts
	3,3'-Carbonylbis(7-methoxycumarine)	0.16 part
	Ethyl p-dimethylaminobenzoate	0.04 part
	(KAYACURE EPA; a product of Nippon Kayaku Co., Ltd.)	

20	Pentaerythritol tetraacrylate	2.0 parts
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The above formulation was weighed, and dissolved using a paint shaker to obtain Solution B.

On a 6 μ m thick polyester film, Solution B was coated using an applicator so as to give a dried film thickness of 2 μ m. A polymerizing layer was thus provided.

1 Next, on the polymerizing layer, Solution A
was coated using an applicator so as to give a dried
film thickness of 2 μm . A photosensitive layer was
thus provided.

5 On the photosensitive layer, a 3 μm thick PVA
layer was further provided to obtain an image forming
medium of the present invention.

 In respect of this image forming medium, $f(\lambda)$
and $g(\lambda)$ were measured according to the measuring
10 method as previously described. Results obtained are
shown in Table 1.

 A mask was fitted to the PVA layer of the
image forming medium of the present Example, and the
resulting medium was imagewise exposed to light to
15 form a latent image.

 Used as a light source was a 10 W fluorescent
lamp having a peak wavelength at 390 nm, and the
exposure was carried out for 1 second with a distance
of 5 cm from the image forming medium.

20 The mask was thereafter removed, and the
medium was heated for 8 seconds using a heat-
developing machine regulated at 110°C. At this time,
the optical density at the absorption peak of the
photosensitive layer was 3.30.

25 The resulting image forming medium was placed
on a hot plate heated to 60°C, which was irradiated

1 for 60 seconds with light of a 10 W fluorescent lamp
having a fluorescent peak at 390 nm, with a distance
from 5 cm from the medium, to form a polymer image.

Subsequently, the PVA film and photosensitive
5 layer were removed. Using as an image receiving
medium a synthetic paper on which an image receiving
layer was formed with polyester resin, the
polymerizing layer and image receiving layer were laid
overlapping each other, followed by heating from the
10 image forming medium side under conditions of 120°C
and 10 seconds. As a result, the dye was diffusion-
transferred from the polymerizing layer to the image
receiving layer, and a sharp red image corresponding
with the imagewise exposed area was obtained on the
15 image receiving paper.

Example 7

Example 6 was repeated to prepare an image
forming medium of the present invention, except that 5
parts of silver benzotriazole and 2 parts of guanidine
20 trichloromethylacetate were used in place of the
silver behenate in Example 6.

The medium was imagewise exposed to light in
the same manner as Example 6, followed by heating for
20 seconds using a heat-developing machine regulated
25 at 120°C. Subsequently, the polymerization exposure
and the subsequent procedures were carried out in the

1 same manner as Example 6. As a result, a sharp red
image was obtained on the image receiving paper.

Example 8

5 In 10 parts of toluene/iso-propanol (1:1), 0.2
part of AgBrI, 0.5 part of silver behenate, 0.4 part
of behenic acid and 0.4 part of 2,6-di-t-butyl-4-o-
tolylmethylphenol were dispersed and dissolved to make
Solution C.

10 Apart therefrom, 1.0 part of polymethyl
methacrylate and 2.0 parts of Oil Scarlet 308 (trade
name; a product of Chuo Gosei Chemical) were dissolved
in 10 parts of methyl ethyl ketone to make Solution D.

15 In addition, 1.0 part of polymethyl
methacrylate and 2.7 parts of epoxyacrylate (trade
name: V5502; a product of Dainippon Ink & Chemicals,
Incorporated) and 0.26 part of benzyl dimethyl ketal
were dissolved in 10 parts of methyl ethyl ketone to
make Solution E.

20 Subsequently, on a 6 μ m thick PET film having
been subjected to heat-resistance treatment, Solution
D was coated using an applicator so as to give a dried
film thickness of 2 μ m to form a coloring material
layer. Solution E was further coated on this coloring
material layer so as to give a dried film thickness of
25 2 μ m to provide a polymerizing layer.

Next, on this polymerizing layer, Solution C

1 was coated using an applicator so as to give a dried
film thickness of 2 μm to provide a photosensitive
layer. On this photosensitive layer, a PVA layer with
a thickness of 3 μm was further provided. An image
5 forming medium of the present invention was thus
prepared.

In respect of this image forming medium, $f(\lambda)$
and $g(\lambda)$ were measured according to the measuring
method as previously described. Results obtained are
10 shown in Table 1.

A mask was fitted to the PVA layer of the
image forming medium of the present Example, and the
resulting medium was imagewise exposed to light to
form a latent image.

15 Used as a light source was a 10 W fluorescent
lamp having a peak wavelength at 420 nm, and the
exposure was carried out for 20 msec with a distance
of 5 cm from the image forming medium.

The mask was thereafter removed, and the
20 medium was heated for 20 seconds using a heat-
developing machine regulated at 120°C.

The resulting image forming medium was
irradiated on its whole surface for 5 seconds with
light of a 10 W fluorescent lamp having a fluorescent
25 peak at 335 nm, with a distance from 3 cm from the
medium, to form a polymer image.

1 Subsequently, the PVA film and photosensitive
layer were removed, and then the dye was transferred
to an image receiving paper in the same manner as
Example 6. As a result, a sharp red image was
5 obtained.

Example 9

In 10 parts of toluene/iso-propanol (1:1), 0.1
part of AgBr, 0.5 part of silver behenate, 0.4 part of
behenic acid, 0.4 part of 2,6-di-t-butyl-4-(3,5-
10 dimethyl-4-hydroxybenzyl)phenol, 0.2 part of
phthalazinone and 1 part of polymethyl methacrylate
were dispersed to make Solution F.

Apart therefrom, 1.0 part of polymethyl
methacrylate, 2.0 parts of Unideck 16-824 (trade name;
15 a product of Dainippon Ink & Chemicals, Incorporated),
0.2 part of 2,4-dichlorothioxanthone, 0.1 part of
ethyl p-dimethylaminobenzoate and 0.2 part of Phorone
Brilliant Scarlet SRL (a product of Sandoz Co.) were
added in 10 parts of methyl ethyl ketone, and the
20 mixture was dispersed using a paint shaker to make
Solution G.

On an aluminum-deposited polyethylene
terephthalate film (a product of Panac Kogyo Co.), the
above Solution G was coated using an applicator so as
25 to give a dried film thickness of 2 μ m to obtain Film
A. Solution F was subsequently coated on a

1 transparent polyethylene terephthalate film, using an
applicator so as to give a dried film thickness of 2
µm to obtain Film B. On the above Film A, Film B was
laminated in the manner that their coatings may face
5 each other. An image forming medium of the present
invention was thus prepared.

In respect of this image forming medium, $f(\lambda)$
and $g(\lambda)$ were measured according to the measuring
method as previously described. Results obtained are
10 shown in Table 1.

A mask was fitted to the image forming medium
thus prepared, and the resulting medium was imagewise
exposed to light to form a latent image.

Used as a light source was a 10 W fluorescent
15 lamp having a fluorescent peak at 390 nm, and the
exposure was carried out for 2 seconds with a distance
of 5 cm from the image forming medium.

The mask was thereafter removed, and the
medium was heated for 10 seconds using a heat-
20 developing machine regulated at 130°C.

The above image forming medium was further
placed on a hot plate heated to 60°C, which was
irradiated for 20 seconds with light of a 10 W
fluorescent lamp having a fluorescent peak at 380 nm,
25 with a distance from 5 cm from the image forming
medium, to form a polymer image.

1 Film B was peeled while the above image forming medium was being passed through rollers heated at 60° under a pressure of 25 kg/cm². As a result, a red image was formed on the film.

5 Example 10

Example 6 was repeated to prepare an image forming medium of the present invention, except that in Example 6 the 3,3'-carbonylbis(7-methoxycumarine) was increased from 0.16 part to 0.35 part so that
10 $g(\lambda_2) = A_3$ may come to be 1.7.

Using this image forming medium, the image formation was carried out in the same manner as Example 6. As a result, a red image was obtained on the image receiving paper. The resulting dye image
15 had a lower maximum optical density for red than that of the image obtained in Example 6, but caused no practical problems. The optical density at the absorption peak of the photosensitive layer was 3.36 after the imagewise exposure and heating were
20 completed.

Example 11

Using a homomixer, a dispersion having the following composition was prepared in a darkroom.

Behenic acid	2.5 parts
25 Silver behenate	4.5 parts
Silver bromide	0.7 part

1	Polyvinyl butyral	10.0 parts
	(S-LEC BL-2; a product of Sekisui Chemical Co., Ltd.)	
	Trimethylolpropane triacrylate	10.0 parts
5	(NK Ester A-TMPT; a product of Shin-Nakamura Chemical Co., Ltd.)	
	Phthalazinone	0.6 part
	Ethyl 4-dimethylaminobenzoate	0.6 part
	3,3'-Carbonylbis(7-diethylaminocumarine)	0.6 part
10	Camphorquinone	0.6 part
	4,4'-Methylenebis(2-methyl-1-naphthol)	3.4 parts
	Xylene	60 parts
	n-Butanol	60 parts

This dispersion was coated on a PET film so as
15 to give a dried film thickness of 5 μm . Subsequently,
on the resulting coating, a PVA layer was further
formed by coating to obtain an image forming medium of
the present invention.

In respect of this image forming medium, $f(\lambda)$
20 and $g(\lambda)$ were measured according to the measuring
method as previously described. Results obtained are
shown in Table 1.

The image forming medium of the present
Example, on which a mask was laid overlapping, was
25 further imagewise exposed to light for 2 seconds
through a filter that transmits the light of 390 nm

1 but does not pass the light of 440 nm or more, using
an ultra-high-pressure mercury lamp having an electric
power of 500 W, with a distance of 60 cm from the
medium. The mask was thereafter removed, and the
5 medium was heated for 16 seconds using a heat-
developing machine regulated at 110°C.

Thereafter, the filter was removed, and the
polymerization exposure was carried out for 10 seconds
using the above ultra-high-pressure mercury lamp with
10 a distance of 60 cm from the medium, to form a polymer
image. Subsequently, the PVA layer was removed by
washing with water, followed by etching with ethanol.
As a result, the polymerized area of the polymer image
remained on the PET film. In the present Example, it
15 was also possible to obtain the image by etching, even
when the exposure time for the polymerization exposure
was varied within the range of from 5 seconds to 30
seconds.

Example 12

20 Example 11 was repeated to obtain an image
forming medium of the present invention, except that
3.4 parts of 4,4'-methylenebis(2-methyl-1-naphthol) in
Example 11 was replaced with 3.6 parts of 4,4'-
methylenebis(2-t-butyl-1-naphthol).

25 In respect of this image forming medium, $f(\lambda)$
and $g(\lambda)$ were measured according to the measuring

1 method as previously described. Results obtained are
shown in Table 1.

The image forming medium of the present
invention was further subjected to formation of a
5 polymer image in the same manner as Example 11,
followed by etching with ethanol. As a result, the
polymerized area of the polymer image remained on the
PET film. In the present Example, it was also
possible to obtain the image by etching, even when the
10 exposure time for the polymerization exposure was
varied within the range of from 2 seconds to 20
seconds.

Example 13

Example 11 was repeated to obtain an image
15 forming medium of the present invention, except that
3.4 parts of 4,4'-methylenebis(2-methyl-1-naphthol) in
Example 11 was replaced with 4.9 parts of 4,4'-
methylenebis(2-benzyl-1-naphthol).

In respect of this image forming medium, $f(\lambda)$
20 and $g(\lambda)$ were measured according to the measuring
method as previously described. Results obtained are
shown in Table 1.

The image forming medium of the present
Example was further imagewise exposed to light in the
25 same manner as Example 11, and hereafter heated for 16
seconds using a heat-developing machine regulated at

1 120°C. The resulting image forming medium was
thereafter subjected to polymerization exposure in the
same manner as Example 11, followed by washing with
water and then etching with ethanol. As a result, the
5 polymerized area of the polymer image remained on the
PET film. In the present Example, it was also
possible to obtain the image by etching, even when the
exposure time for the polymerization exposure was
varied within the range of from 5 seconds to 15
10 seconds.

Example 14

A solution having the following composition
was prepared.

Polymethyl methacrylate	0.26 part
15 Dipentaerythritol hexaacrylate	10 parts
3,3'-Carbonylbis(7-diethylaminocumarine)	0.6 part
1,3,5-Tris(trichloromethyl)triazine	1.3 parts
MS-Cyan-VP	2.5 parts

(a product of Mitsui Toatsu Chemicals, Inc.)

20 Methyl ethyl ketone 60 parts

Using this solution, a polymerizing layer was
formed by coating on a PET film so as to give a dried
film thickness of 2 μ m to provide the polymerization
material as shown in Fig. 12.

25 In a separate system, therefrom, a
photosensitive composition having the following

1 composition was prepared.

Behenic acid	2.5 parts
Silver behenate	4.5 parts
Silver bromide	0.9 part
5 Polyvinyl butyral	10.0 parts
Phthalazinone	1.2 parts
4,4'-Methylenebis(2-methyl-1-naphthol)	3.4 parts
Xylene	60 parts
n-Butanol	60 parts

10 Using this dispersion, this was coated on another PET film so as to give a dried film thickness of 6 μm to provide a photosensitive layer, and on this photosensitive layer, a PVA layer was provided to give the photosensitive material as shown in Fig. 12.

15 In respect of the above polymerization material and photosensitive material, $f(\lambda)$ and $g(\lambda)$ were measured according to the measuring method as previously described. Results obtained are shown in Table 1.

20 The above photosensitive material was further imagewise exposed to light in the same manner as Example 11, and then heated for 10 seconds using a heat-developing machine regulated at 115°C.

25 Thereafter, the photosensitive material and polymerization material were laid overlapping in the manner that the PVA layer and polymerizing layer may

1 face each other, followed by polymerization exposure
for 20 seconds from the photosensitive material side,
using the same light source as Example 11, while
heating with a hot plate of 80°C. The photosensitive
5 material was peeled, and thereafter the polymerization
material was etched with methyl ethyl ketone. As a
result, the polymerized area of the polymer image
remained on the PET film.

In place of the etching, an image receiving
10 paper coated with polyester resin was also laid
overlapping on the polymer image on the polymerization
material, and these were passed through heat rollers
with a nip width of 4 mm, regulated at 130°C, and at a
speed of 1.3 sec/cm. As a result, a cyan image
15 corresponding with the imagewise exposure was formed
on the image receiving paper.

Example 15

A dispersion having the following composition
was prepared in a darkroom.

20	Behenic acid	2.5 parts
	Silver behenate	4.5 parts
	Silver iodobromide	0.7 part
	Polymethyl methacrylate	10.0 parts
	Trimethylolpropane triacrylate	10.0 parts
25	3,3'-Carbonylbis(7-diethylaminocumarine)	0.6 part
	Ethyl 4-dimethylaminobenzoate	0.6 part

1	2-t-Butyl-4-(4-hydroxyphenyl)methyl-1-naphthol	2.9 parts
	Xylene	60.0 parts
	n-Butanol	60.0 parts

5 A homomixer was used to carry out dispersion, and the resulting dispersion was coated on a support comprising a PET film so as to give a dried film thickness of 6 μm to prepare an image forming medium of the present invention.

10 In respect of this image forming medium, $f(\lambda)$ and $g(\lambda)$ were measured according to the measuring method as previously described. Results obtained are shown in Table 1.

 On the image forming layer of the above image
15 forming medium, an anodized aluminum sheet was laminated, and a mask was laid overlapping on the PET film. The resulting medium was imagewise exposed to light for 1 second using a 10 W fluorescent lamp. Thereafter, the mask was removed, followed by heating
20 using a heat-developing machine under conditions of 115°C for 16 seconds.

 The image forming medium was thereafter subjected to polymerization exposure for 5 seconds using ultraviolet light that gave 8.0 mW/cm^2 at the
25 surface of the image forming medium.

 The PET film on the above image forming medium

1 was peeled, followed by etching with ethanol. As a result, the polymerized area of the polymer image remained on the support as a sharp image.

The above conditions for the polymerization exposure were varied. As a result, it was possible to take out images with a good reproducibility when the exposure time for the polymerization exposure was within the range of from 3 seconds to 6 seconds.

Example 16

10 A dispersion having the following composition was prepared in a darkroom.

	Palmitic acid	1.6 parts
	Behenic acid	0.4 part
	Silver behenate	4.0 parts
15	Silver bromide	0.9 part
	Methyl methacrylate/styrene (8/2) copolymer	12.0 parts
	Trimethylolpropane triacrylate	4.0 parts
	Dipentaerythritol hexaacrylate	6.5 parts
20	3,3'-Carbonylbis(7-diethylaminocumarine)	0.5 part
	p-Diethylaminobenzonitrile	0.2 part
	2-Methyl-4-(3,5-dichloro-4-hydroxyphenyl)methyl-1-naphthol	3.2 parts
	Toluene	80.0 parts
25	i-Propanol	40.0 parts

This dispersion was coated on a support

1 comprising a PET film to give a dried film thickness
of 8 μm . An image forming medium of the present
invention was thus prepared.

In respect of this image forming medium, $f(\lambda)$
5 and $g(\lambda)$ were measured according to the measuring
method as previously described. Results obtained are
shown in Table 1.

On the above image forming medium, an aluminum
sheet was laminated, followed by etching in the same
10 manner as Example 15. As a result, the polymerized
area of the polymer image remained on the support as a
sharp image.

The above conditions for the polymerization
exposure were varied. As a result, it was possible to
15 take out images with a good reproducibility when the
exposure time for the polymerization exposure was
within the range of from 3 seconds to 14 seconds.

Example 17

A dispersion having the following composition
20 was prepared in a darkroom.

Behenic acid	2.5 parts
Silver behenate	4.5 parts
Silver bromide	0.7 part
Polyvinyl butyral	0.4 part
25 Polymethyl methacrylate	10.0 parts

1	2,4-Bis[2-(acryloxy)ethoxycarbonyl]toluene	4.0 parts
	Pentaerythritol triacrylate	8.0 parts
	3,3'-Carbonylbis(7-pyrrolidinocumarine)	0.7 part
5	Ethyl 4-dimethylaminobenzoate	0.4 part
	Phthalazinone	0.8 part
	2-Methyl-4-(3,5-dimethyl-4-hydroxyphenyl)methyl-1-naphthol	3.1 parts
	Toluene	80 parts
10	i-Propanol	40 parts

The dispersion with the above composition was coated on a support comprising a PET film so as to give a dried film thickness of 5 μm to prepare an image forming medium of the present invention. In this image forming medium, a polyurethane layer was provided as a subbing layer of the image forming layer.

In respect of this image forming medium, $f(\lambda)$ and $g(\lambda)$ were measured according to the measuring method as previously described. Results obtained are shown in Table 1.

On the image forming layer of the above image forming medium of the present invention, a polyethylene film was laminated, followed by the same manner as Example 15. As a result, a sharp image comprised of the polymerized area of the polymer image

1 was obtained on the support.

Example 18

Example 15 was repeated to prepare an image forming medium of the present invention, except that
5 2.9 parts of 2-t-butyl-4-(4-hydroxyphenyl)methyl-1-naphthol was replaced with 2.9 parts of 2-methyl-4-(4-dimethylaminophenyl)methyl-1-naphthol.

In respect of this image forming medium, $f(\lambda)$ and $g(\lambda)$ were measured according to the measuring
10 method as previously described. Results obtained are shown in Table 1.

This image forming medium was subjected to the same manner as Example 15. As a
result, the polymerized area of the polymer image
15 remained on the support as a sharp image.

The above conditions for the polymerization exposure were varied. As a result, it was possible to
take out images with a good reproducibility when the exposure time for the polymerization exposure was
20 within the range of from 3 seconds to 8 seconds.

Example 19

Heat-diffusible dye, MS-Magenta-VP 1.5 parts

(a product of Mitsui Toatsu Chemicals, Inc.)

Polybutyl methacrylate 7.0 parts

25 The above components were dissolved in 50 parts of methyl ethyl ketone to make Solution H.

1	Polyvinyl butyral	8.0 parts
	Dipentaerythritol hexaacrylate	12.0 parts
	2,4-Diethylthioxanthone	2.4 parts
	Ethyl 4-dimethylaminobenzoate	2.4 parts

5 The above components were dissolved in 80 parts of butanol to make Solution I.

Next, 3.5 parts of behenic acid, 0.8 parts of AgBr, 4.0 parts of silver behenate, 10.0 parts of polyvinyl butyral, 0.2 part of azelaic acid, 0.8 part
10 of phthalazinone and 4.5 parts of 4,4'-benzylidenebis(2,6-di-t-butylphenol) were dispersed in a mixed solution of 30 parts of toluene and 30 parts of i-propanol to make Solution J.

Next, on the PET film, Solution H was coated
15 so as to give a dried film thickness of 2 μm to form a coloring material layer, and then Solution I was coated thereon so as to give a dried film thickness of 4 μm to form a polymerizing layer. On the polymerizing layer, Solution J was further coated so
20 as to give a dried film thickness of 5 μm to form a photosensitive layer, and, finally on the photosensitive layer, a PVA layer with a thickness of 2 μm was provided. An image forming method of the present invention was thus obtained.

25 In respect of this image forming medium, $f(\lambda)$ and $g(\lambda)$ were measured according to the measuring

1 method as previously described. Results obtained are shown in Table 1.

A mask was laid overlapping on this image forming medium, and the resulting medium was imaged
5 exposed to light for 10 seconds using light that gave 900 lux at the part of the image forming layer, and subsequently heated for 30 seconds using a heat-developing machine regulated at 125°C. Next, this image forming medium was subjected to polymerization
10 exposure for 10 seconds using a fluorescent lamp having a peak wavelength at 380 nm, with a distance of 3 cm from the image forming medium.

In this way, as a final step, the PVA layer and photosensitive layer were removed and an image was
15 formed on an image receiving paper in the same manner as Example 6. As a result, an image corresponding with the imaged area was obtainable on the image receiving paper. The image obtained in the present Example showed a lower maximum optical density
20 compared with Example 6, but there was no practical problems.

Also, the image forming medium was subjected to imaged exposure, heat development and polymerization exposure, followed by etching with
25 ethanol in the same manner as Example 6. As a result, an image comprised of the polymerized area of the

1 polymer image was obtainable on the PET film. The
above conditions for the polymerization exposure were
also varied. As a result, it was possible to take out
images comprised of the polymerized area of the
5 polymer image, with a good reproducibility when the
exposure time for the polymerization exposure was
within the range of from 5 seconds to 8 seconds.

Example 20

Example 11 was repeated to prepare an image
10 forming medium of the present invention, except that
in Example 11, 3.4 parts of 4,4'-methylenebis(2-methyl-
1-naphthol) was replaced with 1.7 parts of 2-amino-5-
diethylaminotoluene and 4.6 parts of benzoylaceto-o-
chloroanilide, and the image formation was carried out
15 in the same way. As a result, a sharp image of
polymer was obtained.

On the other hand, no image was obtained when
the benzoylaceto-o-chloroanilide was not used.

Example 21

20 Yellow coating solution:

Polybutyl methacrylate 7.0 parts

(Dianal BR-79; Mitsubishi Rayon Co. Ltd.)

MS-Yellow-VP 1.0 part

(a dye of Mistui Toatsu Chemicals, Inc.)

25 Methyl ethyl ketone 63 parts

Magenta coating solution:

1 Polybutyl methacrylate 7.0 parts
(Dianal BR-79; Mitsubishi Rayon Co. Ltd.)
MS-Magenta-VP 0.6 part
(a dye of Mistui Toatsu Chemicals, Inc.)

5 Methyl ethyl ketone 63 parts

Cyan coating solution:

Polybutyl methacrylate 7.0 parts
(Dianal BR-79; Mitsubishi Rayon Co. Ltd.)

MS-Cyan-VP 0.95 part

10 (a dye of Mistui Toatsu Chemicals, Inc.)

Methyl ethyl ketone 63 parts

The yellow coating solution, magenta coating solution and cyan coating solution each having the above composition were made up. On a 22 μm thick PET
15 film having been subjected to anchoring, these solutions were coated dividedly for each color region, using a three-color gravure coater, to form a coloring material layer. The coloring material layer had a dried film thickness of 2 μm .

20 Next, an emulsion with the following composition was prepared.

AgBr 0.9 part

Silver behenate 5.0 parts

Behenic acid 4.0 parts

25 Phthalazinone 1.0 part

Polyvinyl butyral 10.0 parts

1	2,6-Di-t-butyl-4-(3,5-dimethyl-4-hydroxyphenyl)	
	methylphenol	3.7 parts
	2,4-Diethylthioxanthone	1.6 parts
	Ethyl dimethylbenzoate	1.6 parts
5	Dipentaerythritol hexaacrylate	10.0 parts
	1 wt.% DMF solution of the sensitizing dye used in	
	Example 5	2.0 parts
	Xylene	60.0 parts
	n-Butanol	60.0 parts

10 This emulsion was coated on the above coloring material layer so as to give a dried film thickness of 5 μ m to form a photosensitive polymerizing layer. A protective layer with a dried film thickness of 2 μ m was further provided thereon by use of polyvinyl

15 butyral to obtain an image forming medium of the present invention.

On the photosensitive polymerizing layer on the yellow layer of the above image forming medium, image writing was carried out with a He-Ne laser

20 (output: 5 mW), using a drum-scanning laser beam printer (manufactured by Abe Sekkei). Next, this image forming medium was heated under conditions of 120°C and 20 seconds, and thereafter exposed to light for 40 seconds using a fluorescent lamp having an

25 electric power of 10 W and a fluorescent peak at 390 nm, with a distance of 1 cm from the medium. Finally,

1 an image receiving paper on which an image receiving
layer was previously formed and the above image
forming medium were laminated, followed by heating
under conditions of 130°C and 10 seconds. As a
5 result, a yellow image excellent in both the
brightness and chroma, corresponding with the
imagewise exposure, was formed on the image receiving
paper.

Similarly, on the photosensitive polymerizing
10 layer on the magenta layer of the above image forming
medium, image writing and heat development were
carried out under the same conditions as the case of
the yellow image formation. Thereafter, the resulting
image forming medium was exposed to light for 30
15 seconds using a fluorescent lamp having an electric
power of 10 W and a fluorescent peak at 380 nm, with a
distance of 1 cm from the medium. Finally, an image
receiving paper on which the yellow image had been
formed and the above image forming medium were
20 laminated, followed by heating under conditions of
130°C and 10 seconds. As a result, a magenta image
excellent in both the brightness and chroma,
corresponding with the imagewise exposure, was formed
on the image receiving paper.

25 Similarly, on the photosensitive polymerizing
layer on the cyan layer of the above image forming

1 medium, image writing and heat development were
carried out under the same conditions as the case of
the yellow image formation. Thereafter, the resulting
image forming medium was exposed to light for 30
5 seconds using a fluorescent lamp having an electric
power of 10 W and a fluorescent peak at 390 nm, with a
distance of 1 cm from the medium. Finally, an image
receiving paper on which the yellow image and magenta
image had been formed and the above image forming
10 medium were laminated, followed by heating under
conditions of 130°C and 10 seconds. As a result, a
cyan image excellent in both the brightness and
chroma, corresponding with the imagewise exposure, was
formed on the image receiving paper.

15 The full-color image thus obtained was an
image having excellent brightness and chroma.

Example 22

The cyan coating solution used in Example 21
was coated on a PET film so as to give a dried film
20 thickness of 3 μ m to form a coloring material layer.

Apart from this solution, 5 parts of polyvinyl
butyral, 7 parts of dipentaerythritol hexaacrylate,
1.4 parts of 2,4-diethylthioxanthone and 1.4 parts of
ethyl p-dimethylaminobenzoate were dissolved in 80
25 parts of n-butanol to make Solution L.

In addition, 0.9 part of AgBr, 5.0 parts of

1 silver behenate, 4.0 parts of behenic acid, 1.0 part
of phthalazinone, 10.0 parts of polyvinyl butyral and
3.7 parts of 2,6-di-t-butyl-4-(3,5-dimethyl-4-
hydroxyphenyl)methyl-phenol were dispersed in a
5 solution of 60 parts of toluene and 60 parts of i-
propanol to make Solution M.

On the above coloring material layer, Solution
L was coated so as to give a dried film thickness of 4
 μm to form a polymerizing layer. On this polymerizing
10 layer, Solution M was further coated so as to give a
dried film thickness of 4 μm to form a photosensitive
layer. On the photosensitive layer, an ethanol
solution of polyvinyl butyral was coated with a film
thickness of 2 μm to form a protective layer. An
15 image forming medium of the present invention was thus
prepared.

This image forming medium was imagewise
exposed to light for 10 seconds using a tungsten lamp
that gave an illumination of 900 lux at the surface of
the medium, followed by heating for 20 seconds using a
20 heat-developing machine regulated at 120°C.
Subsequently, the resulting medium was exposed to
light for 30 seconds using a fluorescent lamp having
an electric power of 10 W and a fluorescent peak at
25 380 nm, with a distance of 1 cm from the medium.
Finally, on the resulting image forming medium, an

1 image receiving paper having thereon an image
receiving layer comprising polyester resin was laid
overlapping, followed by heating at 130°C for 10
seconds. As a result, a cyan image was formed on the
5 image receiving paper.

Example 23

In a mixed solution of 60 parts of toluene and
60 parts of i-propanol, 0.7 part of AgBr, 4.5 parts of
silver behenate, 3.2 parts of behenic acid, 9.0 parts
10 of polyvinyl butyral, 10 parts of trimethylolpropane
triacrylate, 0.6 part of p-dimethylaminobenzoic acid,
1.5 parts of 3,3'-carbonylbis(7-dimethylaminocumarine)
and 0.6 part of camphorquinone were dispersed. In the
resulting dispersion, 3.5 parts of a leuco dye 9-
15 phenyl-2,7-dichloro-3,6-dihydroxyxanthene was
dissolved. Preparation of an emulsion was thus
completed.

This emulsion was coated on a PET film so as
to give a dried film thickness of 5 μm to form an
20 image forming layer. On this image forming layer, a
PVA layer with a dried film thickness of 2 μm was
further provided to prepare an image forming medium of
the present invention.

This image forming medium was imagewise
25 exposed to light for 2 seconds through a filter that
does not pass the light of 440 nm or more, using an

1 ultra-high-pressure mercury lamp having an electric
power of 500 W, with a distance of 60 cm from the
medium. The medium was subsequently heated for 16
seconds using a heat-developing machine regulated at
5 115°C. The filter was thereafter removed, and the
resulting medium was subjected to polymerization
exposure for 5 seconds using the ultra-high-pressure
mercury lamp with a distance of 60 cm from the medium.
The PVA layer was removed by washing with water, and
10 the resulting medium was etched with ethanol. As a
result, a polymer image remained on the PET film.

15

20

25

1 Table 1

Exam- ple	A ₂	A ₃	A ₄	λ ₆ (nm)	λ ₃ (nm)	W _{1/2} (nm)	a	k
5 1	1.85	1.26	0.62	383	398	40	0.375	1.93
2	1.54	0.72	0.48	340	343	39	0.077	2.38
3	1.83	1.25	0.61	383	398	40	0.375	1.96
4	1.26	1.14	0.52	383	405	65	0.338	2.79
5	-	-	-	-	-	-	-	-
10 6	1.62	1.27	0.30	377	396	58	0.328	1.79
7	-	-	-	-	-	-	-	-
8	1.58	0.91	0.35	340	355	41	0.366	2.15
9	1.32	0.80	0.27	401	395	57	0.105	2.71
10	-	-	-	-	-	-	-	-
15 11	1.67	1.09	0.41	453	448	46	0.109	2.05
12	2.09	1.07	0.49	452	460	41	0.195	1.58
13	1.83	1.08	0.44	452	442	51	0.196	1.84
14	1.70	1.03	0.46	453	448	46	0.109	2.05
15	1.57	1.16	0.39	451	420	39	0.794	2.22
20 16	1.98	1.12	0.32	452	417	60	0.583	1.61
17	1.14	1.46	0.35	458	425	71	0.465	3.35
18	0.98	1.12	0.42	448	460	52	0.231	4.61
19	2.25	1.13	0.46	383	402	38	0.500	1.42

25 $a = |\lambda_6 - \lambda_3| / w_{1/2}$, $k = G(\lambda_3) / (A_2 - A_4)$

1 Comparative Example 1

 Example 1 was repeated to prepare an image forming medium, except that 2.6 parts of a reducing agent 2,2'-methylenebis(4-methyl-6-t-butylphenol) was
5 used in place of 3.2 parts of the reducing agent 4,4'-methylenebis(2,6-di-t-butylphenol) in Example 1.

 The above image forming medium was imagewise exposed to light in the same manner as Example 1, followed by heating for 10 seconds using a heat-
10 developing machine regulated at 115°C. As a result, a black silver image was formed at the imagewise exposed area. In respect of the imagewise exposed area of this image forming medium, the light-absorption characteristics were measured to find that
15 substantially flat absorption was seen. The optical density at 380 nm was 1.2. Conditions for the heat-development were varied, but no changes were seen in the flat absorption.

 Next, the above image forming medium was exposed
20 to imagewise exposure, heat-development and polymerization exposure in the same manner as Example 1, followed by etching. As a result, the image forming layer was entirely dissolved out when the exposure time for the polymerization exposure was 2
25 seconds or less, and the image forming layer was not dissolved out when the time was longer than 2 seconds.

1 Thus, no image was obtainable.

Comparative Example 2

Example 11 was repeated to prepare an image forming medium, except that 0.6 part of 3,3'-
5 carbonylbis(7-diethylaminocumarine) and 0.6 part of camphorquinone in Example 11 were replaced with 0.5 part of 2,4-dichlorothioxanthone.

In respect of this image forming medium, $f(\lambda)$ and $g(\lambda)$ were measured according to the measuring
10 method as previously described, to reveal that the absorption peak wavelength of $f(\lambda)$ was greatly deviated from the absorption peak wavelength of $g(\lambda)$. Results of measurement were as follows: $A_2 = 1.61$, $A_3 = 0.98$, $A_4 = 0.40$, $W_{1/2} = 46$ nm, $\lambda_2 = 401$ nm, $\lambda_3 = 448$
15 nm, and $k = 2.15$.

This image forming medium was subjected to the image formation in the same manner as Example 11, but there was obtained no sharp image.

Comparative Example 3

20 Example 1 was repeated to prepare an image forming medium, except that 0.4 part of the photopolymerization initiator 2,4-diethylthioxanthone and 0.6 parts of ethyl 4-dimethylaminobenzoate in Example 1 were replaced with 0.7 part of 3,3'-
25 carbonylbis(7-diethylaminocumarine) and 0.5 part of 2,4,6-tris(trichloromethyl)-S-triazine.

1 In respect of this image forming medium, $f(\lambda)$
and $g(\lambda)$ were measured according to the measuring
method as previously described, to reveal that the
absorption peak wavelength of $f(\lambda)$ was greatly
5 deviated from the absorption peak wavelength of $g(\lambda)$.
Results of measurement were as follows: $A_2 = 1.80$, A_3
 $= 1.20$, $A_4 = 0.53$, $W_{1/2} = 40$ nm, $\lambda_2 = 457$ nm, $\lambda_3 = 398$
nm, and $k = 1.94$.

10 This image forming medium was subjected to the
image formation in the same manner as Example 1, but
there was obtained no sharp image.

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The claims defining the invention are as follows:

1. An image forming method comprising:

subjecting an area of an image forming medium containing at least a photosensitive silver halide, an organic silver salt, a reducing agent, a polymerizable polymer precursor, and a photopolymerization initiator having an absorption peak wavelength λ_6 , to imagewise exposure to light, followed by heating to produce in said image forming medium a light-absorbing organic compound having an absorption peak wavelength λ_3 and a half-width $W_{1/2}$, as herein defined, wherein λ_6 is within the range of $\lambda_3 \pm 0.8 W_{1/2}$; and

10 subjecting said image forming medium in which said light-absorbing organic compound has been produced, to polymerization exposure to cause said polymerizable polymer precursor to polymerize;

where light-absorption characteristics of said light-absorbing organic compound are utilized to suppress the polymerization of said polymerizable 15 polymer precursor at the area at which said light-absorbing organic compound has been produced, and

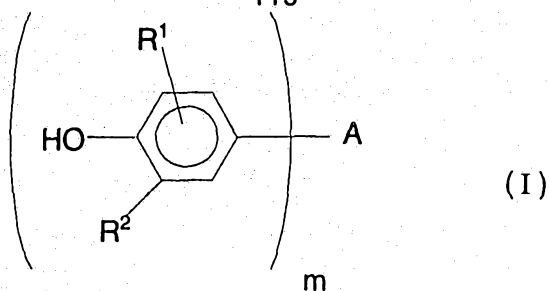
wherein the relationship between a first difference spectrum $G(\lambda)$ of light-absorption characteristics possessed by said image forming medium, light-absorption characteristics $f(\lambda)$ possessed by the area of said image 20 forming medium having been imagewise exposed to light and heated, and light-absorption characteristics $g(\lambda)$ possessed by an area of said image forming medium having not been imagewise exposed to light and heated, $G(\lambda_3)/f(800)-g(800) = k$ (where λ_3 represents an absorption peak wavelength of said light-absorbing organic compound), is $k \geq 1.5$.

25 2. An image forming method according to claim 1, wherein said absorption peak wavelength λ_6 is within the range of $\lambda_3 \pm 0.5 W_{1/2}$.

3. An image forming method according to claim 1 or claim 2, wherein said light-absorbing organic compound is an oxidized product produced as a result of reaction between said organic silver salt and said 30 reducing agent.

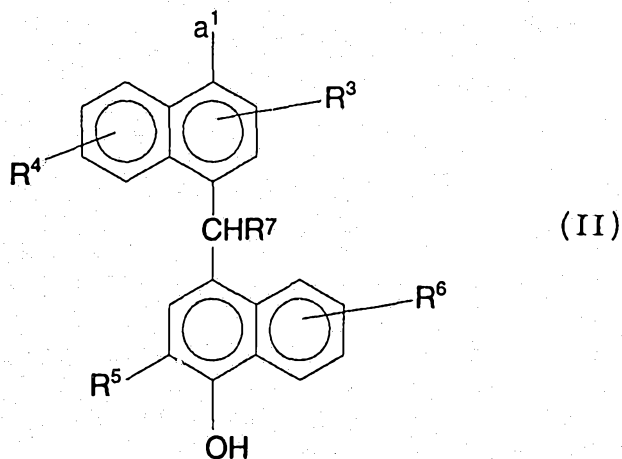
4. An image forming method according to any one of claims 1 to 3, wherein said reducing agent is a compound represented by the following Formula (I):





wherein R¹ and R² each independently represent a hydrogen atom, a hydroxyl group, a halogen atom, a substituted or unsubstituted alkyl group, a substituted or unsubstituted alkenyl group, a substituted or unsubstituted alkynyl group, a substituted or unsubstituted cycloalkyl group, a substituted or unsubstituted aralkyl group, an alkoxy group, or a substituted or unsubstituted amino group; m represents an integer of 1 to 3; and A is a monovalent, divalent or trivalent group and represents a substituted or unsubstituted aralkyl group, a substituted or unsubstituted alkyl group, a substituted amino group, a divalent aralkylidene group, or a divalent alkylidene group, or a trivalent methine group.

5. An image forming method according to any one of claims 1 to 3 wherein said reducing agent is a compound represented by the following Formula (II):

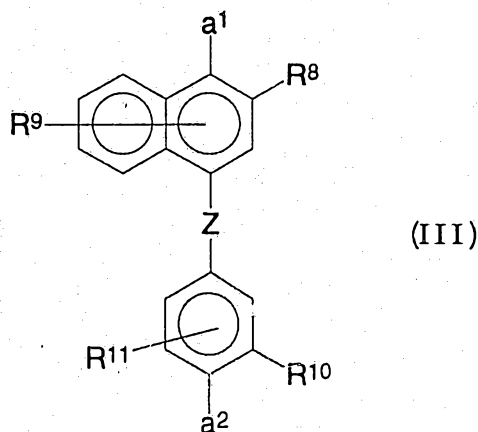


15

wherein R⁵ represents a hydrogen atom, an alkyl group, a cycloalkyl group, or an aralkyl group; R³, R⁴ and R⁶ each independently represent a hydrogen atom, a halogen atom, an alkyl group, an amino group, an aryl group, an aralkyl group, an alkoxy group, a nitro group, an acyl group, or a cyano group; R⁷ represents a hydrogen atom, a substituted or unsubstituted alkyl group, or a substituted or unsubstituted aryl group; and a¹ represents a hydrogen atom, a hydroxyl group, a halogen atom, a substituted or unsubstituted alkyl group, a cycloalkyl group, an alkoxy group, or a substituted or unsubstituted amino group.



6. An image forming method according to any one of claims 1 to 3, wherein said reducing agent is a compound represented by the following Formula (III):



5 wherein R^8 , R^9 , R^{10} and R^{11} each independently represent a substituent selected from the group consisting of a hydrogen atom, a halogen atom, a substituted or unsubstituted alkyl group, a cycloalkyl group, an alkoxy group, a substituted or unsubstituted aralkyl group, a substituted or unsubstituted aryl group, a substituted or unsubstituted amino group, a nitro group, and an acyl group; Z represents a divalent group; and a^1 and a^2 each represent a substituent selected from the group consisting of a hydrogen atom, a hydroxyl group, a halogen atom, a substituted or unsubstituted alkyl group, a cycloalkyl group, an alkoxy group, and a substituted or unsubstituted amino group, provided that at least one of a^1 and a^2 is a hydroxyl group.

15 7. An image forming method according to claim 1 or claim 2, wherein said light-absorbing organic compound is a compound produced as a result of the reaction between i) an oxidized product produced as a result of the reaction between said organic silver salt and said reducing agent and ii) a coupler.

20 8. An image forming method according to claim 7, wherein said reducing agent is selected from the group consisting of p-aminophenols, p-phenylenediamines, and o-aminophenols.

25 9. An image forming method according to claim 7 or claim 8, wherein said coupler is selected from the group consisting of α -acylacetamides, pyrazolones, phenols, and naphthols.

10. An image forming method according to any one of claims 1 to 9, wherein, using as said image forming medium an image forming medium containing a heat-diffusible coloring matter;



said polymerization exposure is carried out to cause said polymerizable polymer precursor to polymerize, thereafter an image receiving medium is laminated on said image forming medium, and then the heat-diffusible coloring matter is transferred to said image receiving medium.

5 11. An image forming method according to any one of claim 1 to 9, wherein, using as said image forming medium an image forming medium on which an image receiving medium has been laminated;

said polymerization exposure is carried out to cause said polymerizable polymer precursor to polymerize, and thereafter the image receiving medium is
10 peeled to separate the area at which said polymerizable polymer precursor has polymerized and the area at which no polymerization has proceeded.

12. An image forming method according to any one of claims 1 to 9, wherein said image forming medium has i) a photosensitive layer containing at least said photosensitive silver halide, said organic silver salt and said reducing
15 agent, and ii) a polymerizing layer containing at least said polymerizable polymer precursor and said photopolymerization initiator.

13. An image forming method according to claim 12, wherein, using as said image forming medium an image forming medium containing a heat-diffusible coloring matter in said polymerizing layer;

20 said polymerization exposure is carried out to cause said polymerizable polymer precursor to polymerize, and thereafter the heat-diffusible coloring matter is transferred to an image receiving medium.

14. An image forming method according to claim 12, wherein, using as said image forming medium an image forming medium having a coloring
25 material layer containing a heat-diffusible coloring matter, said polymerizing layer and said photosensitive layer in the order of the coloring material layer, polymerizing layer and photosensitive layer;

said polymerization exposure is carried out to cause said polymerizable polymer precursor to polymerize, and thereafter the heat-diffusible coloring
30 matter is transferred to an image receiving medium.

15. An image forming method according to claim 12, wherein said polymerization exposure is carried out to cause said polymerizable polymer precursor to polymerize, and thereafter said photosensitive layer is peeled to separate the area at which said polymerizable polymer precursor has
35 polymerized and the area at which no polymerization has proceeded.

16. An image forming method comprising;
subjecting an area of a photosensitive material containing at least a photosensitive silver halide, an organic silver salt and a reducing agent, to



imagewise exposure, followed by heating to produce in said photosensitive material a light-absorbing organic compound having an absorption peak wavelength λ_3 and half-width $W_{1/2}$, as herein defined;

laminating a polymerization material containing at least a polymerizable
5 polymer precursor and a photopolymerization initiator having an absorption peak wavelength λ_6 , in which said light-absorbing organic compound has been produced, on said photosensitive material, wherein λ_6 is within the range of $\lambda_3 \pm 0.8 W_{1/2}$; and

subjecting said photosensitive material and said polymerization material
10 to polymerization exposure to cause said polymerizable polymer precursor to polymerize;

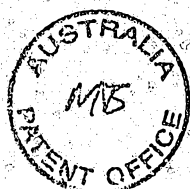
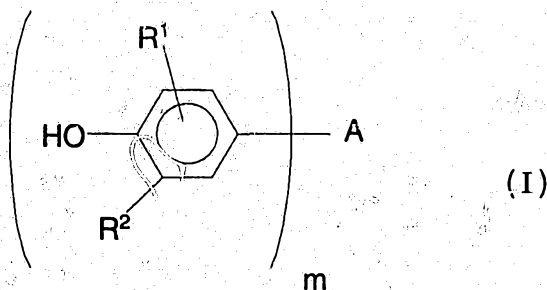
where light-absorption characteristics of said light-absorbing organic compound are utilized to suppress the polymerization of said polymerizable polymer precursor at the area at which said light-absorbing organic compound
15 has been produced, and

wherein the relationship between a first difference spectrum $G(\lambda)$ of light-absorption characteristics possessed by said photosensitive material, light-absorption characteristics $f(\lambda)$ possessed by the area of said photosensitive material having been imagewise exposed to light and heated,
20 and light-absorption characteristics $g(\lambda)$ possessed by an area of said photosensitive material having not been imagewise exposed to light and heated, $G(\lambda_3)/f(800)-g(800) = k$ (where λ_3 represents an absorption peak wavelength of said light-absorbing organic compound), is $k \geq 1.5$.

17. An image forming method according to claim 16, wherein, said
25 absorption peak wavelength λ_6 is within the range of $\lambda_3 \pm 0.5 W_{1/2}$.

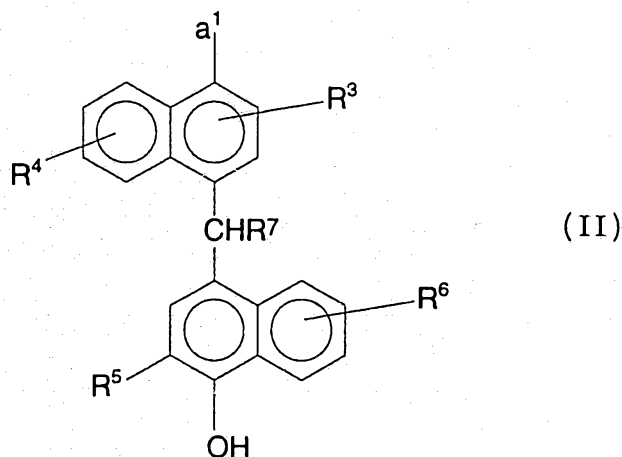
18. An image forming method according to claim 16 or claim 17, wherein said light-absorbing organic compound is an oxidized product produced as a result of the reaction between said organic silver salt and said reducing agent.

30 19. An image forming method according to any one of claims 16 to 18, wherein said reducing agent is a compound represented by the following Formula (i):



wherein R¹ and R² each independently represent a hydrogen atom, a hydroxyl group, a halogen atom, a substituted or unsubstituted alkyl group, a substituted or unsubstituted alkenyl group, a substituted or unsubstituted alkynyl group, a substituted or unsubstituted cycloalkyl group, a substituted or unsubstituted aralkyl group, an alkoxy group, or a substituted or unsubstituted amino group; m represents an integer of 1 to 3; and A is a monovalent, divalent or trivalent group and represents a substituted or unsubstituted aralkyl group, a substituted or unsubstituted alkyl group, a substituted amino group, a divalent aralkylidene group, or a divalent alkylidene group, or a trivalent methine group.

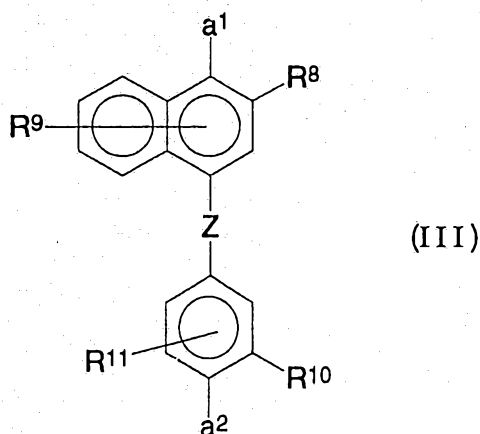
20. An image forming method according to any one of claims 16 to 18, wherein said reducing agent is a compound represented by the following Formula (II):



15 wherein R⁵ represents a hydrogen atom, an alkyl group, a cycloalkyl group, or an aralkyl group; R³, R⁴ and R⁶ each independently represent a hydrogen atom, a halogen atom, an alkyl group, an amino group, an aryl group, an aralkyl group, an alkoxy group, a nitro group, an acyl group, or a cyano group; R⁷ represents a hydrogen atom, a substituted or unsubstituted alkyl group, or a substituted or unsubstituted aryl group; and a¹ represents a hydrogen atom, a hydroxyl group, a halogen atom, a substituted or unsubstituted alkyl group, a cycloalkyl group, an alkoxy group, or a substituted or unsubstituted amino group.

21. An image forming method according to any one of claims 16 to 25 18, wherein said reducing agent is a compound represented by the following Formula (III):





wherein R⁸, R⁹, R¹⁰ and R¹¹ each independently represent a substituent selected from the group consisting of a hydrogen atom, a halogen atom, a substituted or unsubstituted alkyl group, a cycloalkyl group, an alkoxy group, a substituted or unsubstituted aralkyl group, a substituted or unsubstituted aryl group, a substituted or unsubstituted amino group, a nitro group, and an acyl group; Z represents a divalent group; and a¹ and a² each represent a substituent selected from the group consisting of a hydrogen atom, a hydroxyl group, a halogen atom, a substituted or unsubstituted alkyl group, a cycloalkyl group, an alkoxy group, and a substituted or unsubstituted amino group, provided that at least one of a¹ and a² is a hydroxyl group.

22. An image forming method according to claim 16 or claim 17, wherein said light-absorbing organic compound is a compound produced as a result of the reaction between i) an oxidized product produced as a result of the reaction between said organic silver salt and said reducing agent and ii) a coupler.

23. An image forming method according to claim 22, wherein said reducing agent is selected from the group consisting of p-aminophenols, p-phenylenediamines, and o-aminophenols.

24. An image forming method according to claim 22 or claim 23, wherein said coupler is selected from the group consisting of α-acetylacetamides, pyrazolones, phenols, and naphthols.

25. An image forming method according to any one of claims 16 to 24, wherein, using as said polymerization material a polymerization material containing a heat-diffusible coloring matter;

said polymerization exposure is carried out to cause said polymerizable polymer precursor to polymerize, and thereafter the heat-diffusible coloring matter is transferred to an image receiving medium.



26. An image forming method according to any one of claims 16 to 24, wherein, using as said polymerization material a polymerization material having i) a coloring material layer containing a heat-diffusible coloring matter and ii) a polymerizing layer containing said polymerizable polymer precursor and photopolymerization initiator;

said polymerization exposure is carried out to cause said polymerizable polymer precursor to polymerize, and thereafter said heat-diffusible coloring matter is transferred to an image receiving medium.

27. An image forming method according to any one of claims 16 to 24, wherein said polymerization exposure is carried out to cause said polymerizable polymer precursor to polymerize, and thereafter said photosensitive material is peeled to separate the area at which said polymerizable polymer precursor has polymerized and the area at which no polymerization has proceeded.

28. An image forming medium, comprising i) a photosensitive silver halide, an organic silver salt and a reducing agent that react with each other to produce a light-absorbing organic compound having an absorption peak wavelength λ_3 and a half-width $W_{1/2}$, as herein defined, as a result of imagewise exposure and heating of an area of said image forming medium, ii) a polymerizable polymer precursor, and iii) a photopolymerization initiator having an absorption peak wavelength λ_6 , wherein λ_6 is within the range of $\lambda_3 \pm 0.8 W_{1/2}$;

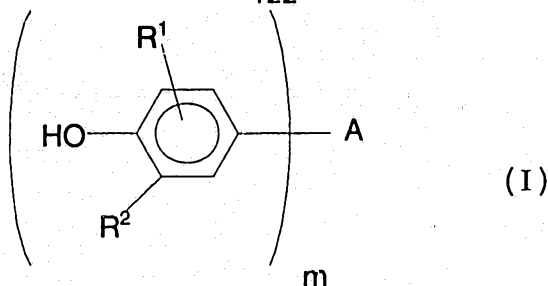
said light-absorbing organic compound being capable of absorbing light with wavelengths to which said photopolymerization initiator has a sensitivity; and

wherein the relationship between a first difference spectrum $G(\lambda)$ of light-absorption characteristics possessed by said image forming medium, light-absorption characteristics $f(\lambda)$ possessed by the area of said image forming medium having been imagewise exposed to light and heated, and light-absorption characteristics $g(\lambda)$ possessed by an area of said image forming medium having not been imagewise exposed to light and heated, $G(\lambda_3)/f(800)-g(800) = k$ (where λ_3 represents an absorption peak wavelength of said light-absorbing organic compound), is $k \geq 1.5$.

29. An image forming medium according to claim 28, wherein, said absorption peak wavelength λ_6 is within the range of $\lambda_3 \pm 0.5 W_{1/2}$.

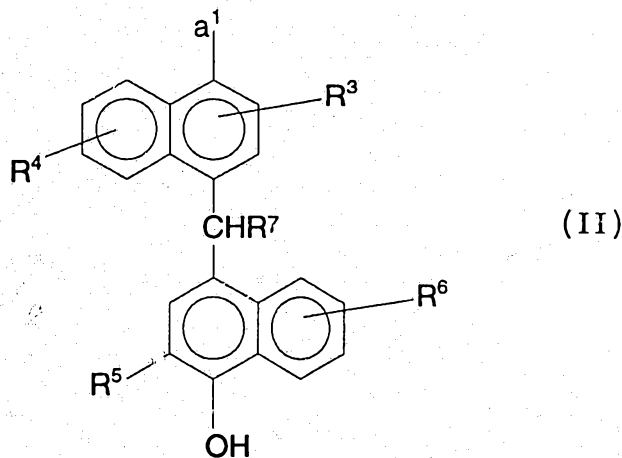
30. An image forming medium according to claim 28 or claim 29, wherein said reducing agent is a compound represented by the following Formula (I):





wherein R¹ and R² each independently represent a hydrogen atom, a hydroxyl group, a halogen atom, a substituted or unsubstituted alkyl group, a substituted or unsubstituted alkenyl group, a substituted or unsubstituted alkynyl group, a substituted or unsubstituted cycloalkyl group, a substituted or unsubstituted aralkyl group, an alkoxy group, or a substituted or unsubstituted amino group; m represents an integer of 1 to 3; and A is a monovalent, divalent or trivalent group and represents a substituted or unsubstituted aralkyl group, a substituted or unsubstituted alkyl group, a substituted amino group, a divalent aralkylidene group, or a divalent alkylidene group, or a trivalent methine group.

31. An image forming medium according to claim 28 or claim 29, wherein said reducing agent is a compound represented by the following Formula (II):

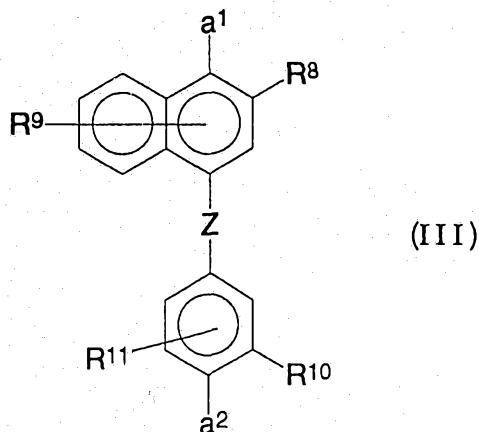


15

wherein R⁵ represents a hydrogen atom, an alkyl group, a cycloalkyl group, or an aralkyl group; R³, R⁴ and R⁶ each independently represent a hydrogen atom, a halogen atom, an alkyl group, an amino group, an aryl group, an aralkyl group, an alkoxy group, a nitro group, an acyl group, or a cyano group; R⁷ represents a hydrogen atom, a substituted or unsubstituted alkyl group, or a substituted or unsubstituted aryl group; and a¹ represents a hydrogen atom, a hydroxyl group, a halogen atom, a substituted or unsubstituted alkyl group, a cycloalkyl group, an alkoxy group, or a substituted or unsubstituted amino group.



32. An image forming medium according to claim 28 or claim 29, wherein said reducing agent is a compound represented by the following Formula (III):



5 wherein R⁸, R⁹, R¹⁰ and R¹¹ each independently represent a substituent selected from the group consisting of a hydrogen atom, a halogen atom, a substituted or unsubstituted alkyl group, a cycloalkyl group, an alkoxy group, a substituted or unsubstituted aralkyl group, a substituted or unsubstituted aryl group, a substituted or unsubstituted amino group, a nitro group, and an acyl group; Z represents a divalent group; and a¹ and a² each represent a
10 substituent selected from the group consisting of a hydrogen atom, a hydroxyl group, a halogen atom, a substituted or unsubstituted alkyl group, a cycloalkyl group, an alkoxy group, and a substituted or unsubstituted amino group, provided that at least one of a¹ and a² is a hydroxyl group.

15 33. An image forming medium according to any one of claims 28 to 32, wherein said medium further contains a heat-diffusible coloring matter.

34. An image forming medium according to any one of claims 28 to 32, comprising i) a photosensitive layer containing at least said photosensitive silver halide, said organic silver salt and said reducing agent, and ii) a
20 polymerizing layer containing at least said polymerizable polymer precursor and said photopolymerization initiator.

35. An image forming medium according to claim 34, wherein said polymerizing layer contains a heat-diffusible coloring matter.

36. An image forming medium according to any one of claims 28 to
25 32, comprising i) a photosensitive layer containing at least said photosensitive silver halide, said organic silver salt and said reducing agent, ii) a polymerizing layer containing at least said polymerizable polymer precursor and said photopolymerization initiator, and iii) a coloring material layer containing at least a heat-diffusible coloring matter, which are provided in this order.



37. An image forming medium according to any one of claims 28 to 32, wherein said medium contains a coupler.

38. An image forming medium according to claim 28 or claim 29, wherein said medium contains a coupler, and said reducing agent is selected from the group consisting of p-aminophenols, p-phenylenediamines, and o-aminophenols.

39. An image forming medium according to claim 38, wherein said coupler is selected from the group consisting of α -acylacetamides, pyrazolones, phenols, and naphthols.

10 40. An image forming medium according to claim 38 or claim 39, wherein said medium contains a heat-diffusible coloring matter.

41. An image forming medium according to claim 38, comprising i) a photosensitive layer containing at least said photosensitive silver halide, said organic silver salt and said reducing agent, and ii) a polymerizing layer
15 containing at least said polymerizable polymer precursor and said photopolymerization initiator.

42. An image forming medium according to claim 41, wherein said polymerizing layer contains a heat-diffusible coloring matter.

43. An image forming medium according to claim 38, comprising i) a
20 photosensitive layer containing at least said photosensitive silver halide, said organic silver salt, said coupler and said reducing agent, ii) a polymerizing layer containing at least said polymerizable polymer precursor and said photopolymerization initiator, and iii) a coloring material layer containing at least a heat-diffusible coloring matter, which are provided in this order.

25 44. An image forming method according to claim 10, wherein said image forming medium comprises i) a coloring material layer containing at least said heat-diffusible coloring matter, and ii) an image forming layer containing at least said photosensitive silver halide, said organic silver salt, said reducing agent, said polymerizable polymer precursor and said photopolymerization
30 initiator.

45. An image forming medium according to claim 33, comprising i) a coloring material layer containing at least said heat-diffusible coloring matter, and ii) an image forming layer containing at least said photosensitive silver halide, said organic silver salt, said reducing agent, said polymerizable polymer
35 precursor and said photopolymerization initiator.

46. An image forming method substantially as herein described with reference to any one of the Examples excluding the Comparative Examples.



FIG. 1

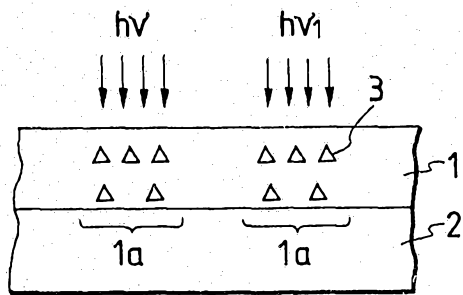


FIG. 2

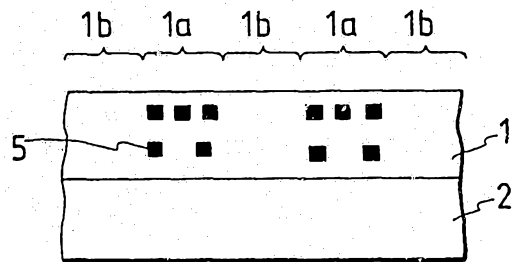


FIG. 3

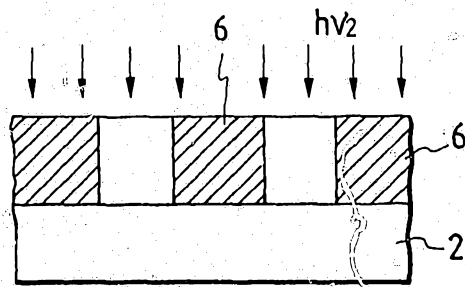


FIG. 4

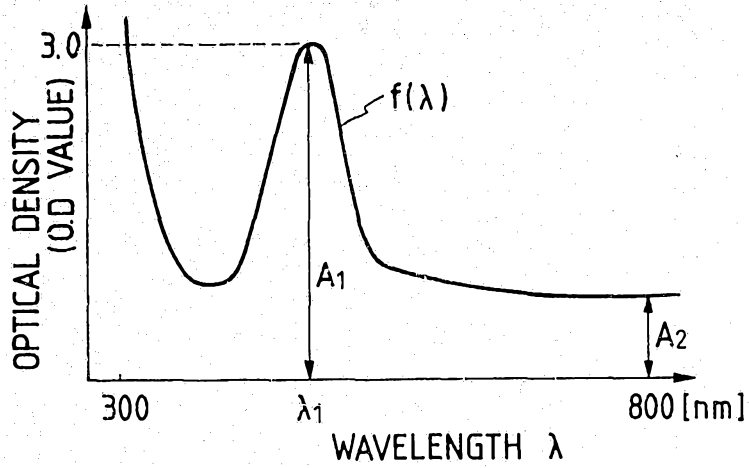


FIG. 5

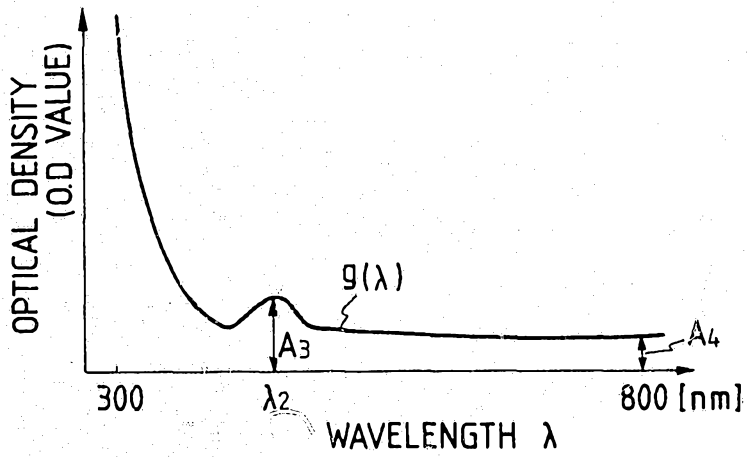
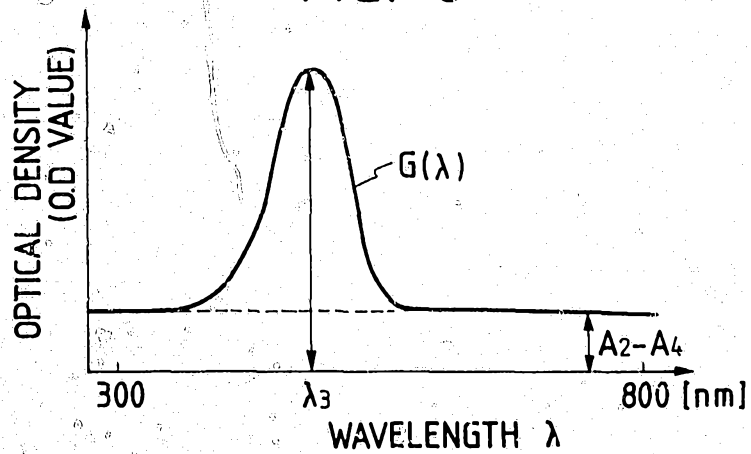


FIG. 6



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FIG. 7

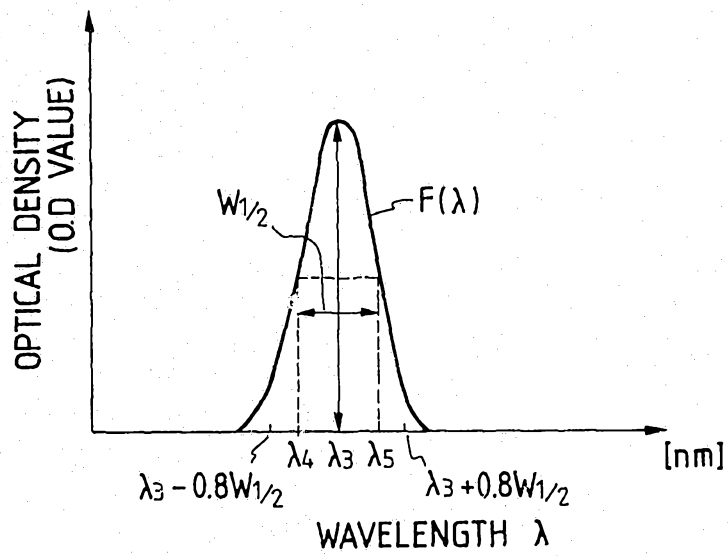


FIG. 8

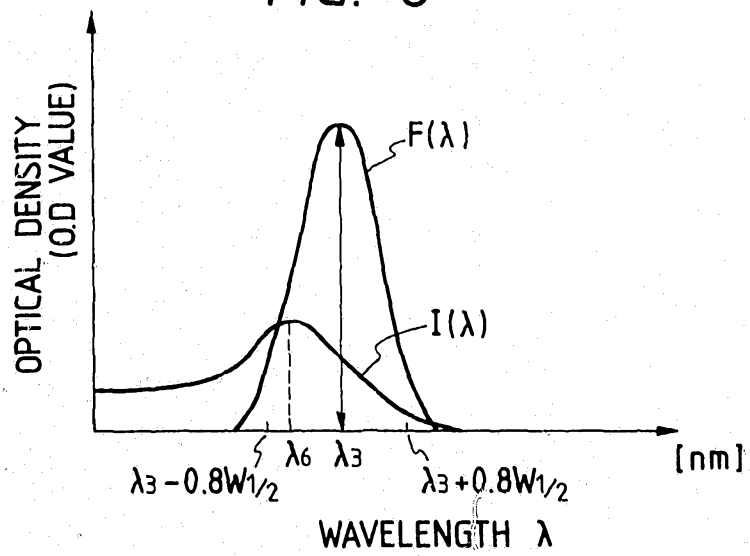


FIG. 9

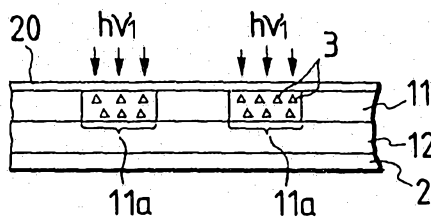


FIG. 10

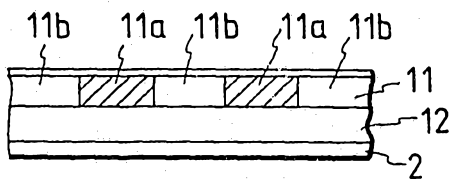


FIG. 11

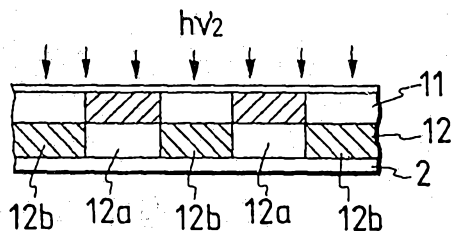


FIG. 12

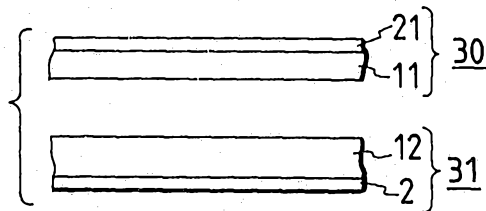


FIG. 13

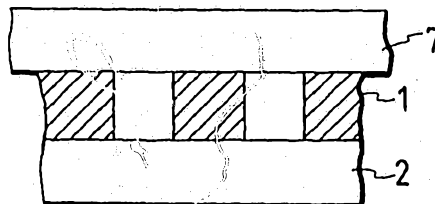


FIG. 14

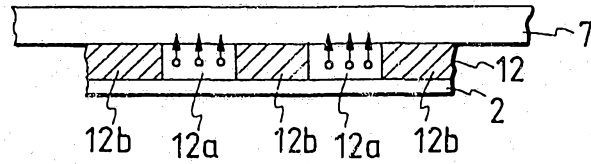


FIG. 15

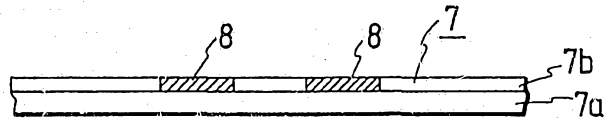


FIG. 16

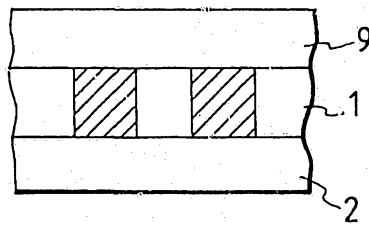


FIG. 17

