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㊴ Variable contrast X-ray material.

㊼ Disclosed is a silver halide photographic light-sensitive material comprising a support and an first emulsion layer (the HS layer) having a first maximum density on one side of a support and an second emulsion layer (the LS layer) on the other side of a support having a said second maximum density which second maximum density is lower than first maximum density, wherein the HS layer has a maximum density of 1.80 or more, when exposure is performed on the HS layer such that the density of the HS layer after processing is a fogging density + 1.10, the density of the LS layer is a fogging density + 0.20 or low, and when exposure is performed on the HS layer, the gradient of a straight line connecting a fogging density + 0.5 and a fogging density + 1.3 in the characteristics curve for the HS layer is within the range of 1.50 to 2.90; and when exposure is performed from the LS layer, the gradient of a straight line connecting a fogging density + 0.3 and a fogging density + 0.6 in the characteristic curve for the LS layer is not less than 1.10, and the sensitivity of the HS layer (S_H) is lower than that of the LS layer (S_L) wherein each of S_H and S_L is the reciprocal of an amount of exposure needed to obtain a density represented by the following formula:

[(Maximum density - fogging density) × 0.4] + fogging density.

A silver halide photographic light-sensitive material according to this invention is capable of providing a highly-sensitive silver halide photographic material for X-ray photography.

Rank Xerox (UK) Business Services

FIELD OF THE INVENTION

The present invention relates to a silver halide light-sensitive material for X-ray photography which enables intended photographic properties to be obtained with one and the same light-sensitive material.

BACKGROUND OF THE INVENTION

Today, a wide variety of X-ray films for medical use are put on the market so that different X-ray films can be employed for different purposes. X-ray films manufactured by Konica Corp. include SR-G for ordinary X-ray examination, high-speed SR-V for X-ray examination using a contrast medium, high-contrast SR-H or SR-HG, low-contrast SR-L for X-ray examination of a digestive organ, wide-latitude SR-C for X-ray examination of the chest, and highly sharp new-CM for X-ray examination of the breast.

Keeping such a wide variety of X-ray films makes the task of inventory control extremely troublesome, and may lead to the misapplication of a film. Misuse of an X-ray film is dangerous, since it may result in an erroneous diagnosis.

For X-ray film manufacturers or distributors, manufacturing or selling such a wide variety of X-ray films is unfavorable, since it causes the manufacturing or selling cost to increase and makes the distribution route extremely complicated.

SUMMARY OF THE INVENTION

One object of the present invention is to provide a silver halide photographic light-sensitive material for X-ray photography, which enables intended photographic properties to be obtained, according to the purpose of photographing, with one and the same light-sensitive material.

Another object of the present invention is to provide a highly-sensitive silver halide photographic light-sensitive material for X-ray photography, which enables an image with improved sharpness to be formed by simply changing the manner of combination of intensifying screen to be applied to the front and back of the light-sensitive material, as well as to provide a method of forming an image using said light-sensitive material.

As a result of extensive studies, the inventors of the present invention have found that the above objects can be attained by:

(1) A silver halide photographic light-sensitive material comprising a support and an first emulsion layer (the HS layer) having a first maximum density on one side of a support and an second emulsion layer (the LS layer) on the other side of a support having a said second maximum density which second maximum density is lower than first maximum density, wherein the HS layer has a maximum density of 1.80 or more, when exposure is performed on the HS layer such that the density of the HS layer after processing is a fogging density + 1.10, the density of the LS layer is a fogging density + 0.20 or low, and when exposure is performed on the HS layer, the gradient of a straight line connecting a fogging density + 0.5 and a fogging density + 1.3 in the characteristics curve for the HS layer is within the range of 1.50 to 2.90; and when exposure is performed from the LS layer, the gradient of a straight line connecting a fogging density + 0.3 and a fogging density + 0.6 in the characteristic curve for the LS layer is not less than 1.10, and the sensitivity of the HS layer (S_H) is lower than that of the LS layer (S_L) wherein each of S_H and S_L is the reciprocal of an amount of exposure needed to obtain a density represented by the following formula:

$$[(\text{Maximum density - fogging density}) \times 0.4] + \text{fogging density}.$$

(2) The silver halide photographic light-sensitive material of (1), wherein a ratio (S_L'/S_L) of the sensitivity (S_L') of the LS layer obtained when exposure is performed on the HS layer through fluorescent intensifying screen to that (S_L') of the LS layer obtained when exposure is performed from the LS layer through fluorescent intensifying screen is not less than 0.12.

(3) The silver halide photographic light-sensitive material of (2), wherein a ratio (S_L'/S_L) of the sensitivity (S_L') of the LS layer obtained when exposure is performed on the HS layer through fluorescent intensifying screen to that (S_L') of the LS layer obtained when exposure is performed from the LS layer through fluorescent intensifying screen is not less than 0.12, and a ratio (S_H'/S_H) of the sensitivity of the LS layer fluorescent intensifying screen (S_H') to that of the HS layer obtained when exposure is performed from the HS layer through fluorescent intensifying screen (S_H') is not more than 0.35.

(4) The silver halide photographic light-sensitive material of (2), wherein, when exposure is performed with fluorescent intensifying screen being applied only to the HS layer, in the combined characteristic curve for the HS and LS layers, the gradient of a straight line connecting a fogging density + 0.25 and a fogging density + 2.0 (G_w) is within the range from 2.10 to 2.90.

(5) A image forming method for a silver halide photographic material of (2), wherein exposure is performed with fluorescent intensifying screen being applied only to the HS layer.

(6) The method for a silver halide photographic material of (1) or (2), wherein exposure method is performed with a sheet of fluorescent intensifying screen being applied to each of the HS and LS layer of said silver halide photographic light-sensitive material.

(7) The method for a silver halide photographic material of (3), wherein exposure is performed with high-speed fluorescent intensifying screen and low-speed fluorescent intensifying screen being applied to the HS layer and the LS layer, respectively of said silver halide photographic light-sensitive material.

(8) The method for a silver halide photographic material of (3), wherein exposure is performed with high-speed fluorescent intensifying screen being applied to the LS layer and low-speed fluorescent intensifying screen being applied to the HS layer of said silver halide photographic light-sensitive material.

(9) A silver halide photographic light-sensitive material of (1), (2) or (4), wherein each of the HS and LS layers contains an emulsion layer in which the project area of tabular silver halide grains with an aspect ratio of 3 or more which accounts for 50 % or more of the total project area.

(10) The silver halide photographic light-sensitive material of (4), wherein, when a fluorescent intensifying screen containing gadolinium sulfaoxide:terbium ($Gd_2O_2S:Tb$) is used as a fluorescent body, the S_L'/S_L ratio is not less than 0.12 and the S_H'/S_H ratio is not more than 0.35.

(11) The silver halide photographic light-sensitive material of (4), wherein the sensitivity (S_L) of the LS layer is 1.05 to 1.90 times as high as that (S_H) of the HS layer.

(12) A silver halide photographic light-sensitive material comprising at least one light-sensitive silver halide emulsion layer provided on both sides of the support, and the photographic property on one side of the support is different from the photographic property on the other side of the support and at least one light-sensitive silver halide emulsion layer provided on one side of the support contains a material exhibiting a higher absorption to 560-700 nm than to 545 nm.

DETAILED DESCRIPTION OF THE INVENTION

To realize both single-sided photographing (applying a sheet of intensifying screen to one side of a light-sensitive material) and double-sided photographing (applying intensifying screen to the both sides of a light-sensitive material) with one and the same light-sensitive material, the amount of light that arrives, after passing through the HS side, at the boundary between the LS side and the support [$=(S_L'/S_L)$] should preferably be in the range of 12% to 50%, more preferably 14% to 35%.

If this amount is too small, i.e., 10% or less, the image forming efficiency of the LS side will be lowered when sensitizing paper is applied only to the HS side. In this case, the density of a high density area formed by the LS side will be lowered significantly, and as a result, the characteristic curve formed by the LS side cannot be joined smoothly to that formed by the HS side. In the case of an X-ray film for single-sided photographing only, this amount should preferably be larger.

If the amount of light passing through the HS side exceeds 50%, the double-sided photographing will be accompanied by such problems as significant deterioration of image quality (in particular, sharpness) due to increased cross-over light, as well as insufficient manifestation of the effects of intensifying screen applied to each side of the film. To obtain a light-sensitive material improved in image quality, which enables intended photographic properties to be obtained with one and the same light-sensitive material, the amount of light transmitted by the HS side should preferably be 12% to 50%, more preferably 14% to 35%.

Meanwhile, the amount of light passing through the LS sion side and arriving at the boundary between the support and the HS side should preferably be 0% to 35%, more preferably 12% to 30%.

When high-speed sensitizing paper and low-speed sensitizing paper are applied to the HS side and the LS side, respectively, the amount of light transmitted by the LS side is required to be as small as possible in order to improve the sharpness of the HS side, where a middle- to high-density area is formed.

The amount of light transmitted by the LS side can be decreased by the provision of a cross over light-preventing layer under the emulsion layer of the LS side or by the addition of a large amount of a dye to the emulsion layer of the LS side. However, if this amount of light is extremely small, i.e., 10% or less, the image-forming efficiency will be lowered significantly when intensifying screen is applied only to the HS side.

In the invention, the S_H'/S_H ratio (the amount of light transmitted by the LS side) should preferably be

0.35 or less. The S_H'/S_H ratio can be minimized by providing a cross over light-preventing layer between the emulsion layer of the HS or the LS side and the support. The provision of such layer, however, may result in a lowering in sensitivity when intensifying screen is applied only to the HS side. Even when such layer is provided, the S_H'/S_H ratio should not be lower than 0.12. It is preferable to cut cross over light not by providing a cross over light-preventing layer but by increasing the light absorbing power of the emulsion layer itself.

In the invention, it is preferred that intensifying screen be applied to the HS side, or high-speed intensifying screen and low-speed intensifying screen be applied to the LS side and the HS side, respectively.

When a high-contrast photograph is required, the above combination may be reversed. Lower contrast and wider latitude can be realized by the application of intensifying screen to the LS side.

In the light-sensitive material of the invention, the HS and LS sides have different photographic properties, and hence, discrimination between these sides is necessary. As in conventional single-sided light-sensitive materials, a notch may be provided. One emulsion side can be distinguished from the other more effectively by a difference in the amount of reflected safe light in the dark room. In the invention, as a fluorescent substance, use is made of gadolinium sulfaoxide:terbium. To prevent sensitivity from lowering, therefore, a substance having a higher absorption to safe light, which normally consists of rays with wavelengths of 560 nm or more, should be added to one of the emulsion sides. Examples of such substance include a coupler that has developed cyan (a color complementary to red) or a (bluish) green dye which exhibits a lower absorption to light of 545 nm in wavelength. This substance should preferably be added to an intended emulsion side in such an amount that the amount of safe light reflected by this emulsion side will be smaller than that reflected by the other emulsion side by 30% or more. Any substance will do, as long as it has no adverse effects on the photographic properties of a light-sensitive material, and as long as it absorbs light of 560 μm or more in wavelength. Though it is preferable that substances having high absorption for light with a wavelength ranging from 560 nm to 700 nm are used on one side of a support, they may also be used on both sides of the support. For instance, a solution obtained by dissolving a coupler that has developed a color or an anthraquinone-based dye in a high-boiling point organic solvent, or an aqueous solution of an oxanol-based dye (which is soluble in water, and is hardly adsorbed by a silver halide) can be added to an emulsion layer, a protective layer, an intermediate layer or a subbing layer of an intended emulsion side.

There are some cases where a large amount of a silver halide should be contained in the HS side. In these cases, a hydrophilic polymer which can be removed therefrom during the steps of development, fixing and rinsing (e.g. polyvinyl alcohol, polyacrylic acid, polyacrylamide, dextran) should preferably be added to the HS side in an amount of 0.1 to 2.5 g per square meter.

To attain rapid processing, the amount of a silver halide should preferably be 4.0 g per square meter of a light-sensitive material.

The sensitivity of each emulsion side is defined as the reciprocal of the amount of X-ray which is needed to obtain a density value which is expressed by:

$$(\text{Max. density - fogging density}) \times 0.4 + \text{fogging density}$$

In the invention, it is preferred that the maximum density of the HS side be 1.80 or more. When photographing is performed with intensifying screen being applied to the HS side only, the HS side will be responsible for a density area extending nearly to 1.80; which means that most of the density area needed for diagnosis can be formed by the HS side. In this case, an image with extremely high sharpness can be obtained.

When a density area extending nearly to 1.80 is formed only by the HS side, the amount of cross over light passing through the HS side and arriving at the boundary between the LS side and the support should preferably be 35% or less.

In the invention, as a silver halide, use can be made of any of conventional photographic silver halides, such as silver iodobromide, silver iodochloride and silver iodochlorobromide. Of them, silver iodobromide is especially preferable in respect of sensitivity.

The shape of a silver halide grain is not limitative; isotrophic crystals such as cubic, octahedral and tetradecahedral crystals; polyhedral crystals such as spherical crystals; and crystals with defective sides such as twin crystals. A mixture or composite form of these crystals is also usable. The size of silver halide grains may be 0.1 μm to 20 μm.

An emulsion to be used in the light-sensitive material of the invention can be prepared by known methods; for examples, by a method described in "Emulsion Preparation and Type", Research Disclosure

No. 17643, December, 1978, pages 22 to 23; a method described in Research Disclosure No. 18716, November, 1979, page 648; a method described in T.H. James, "The Theory of the Photographic Process", Macmillan, 4th ed., 1977, pages 38 to 104; a method described in G.F. Dauffin, "Photographic Emulsion Chemistry", Focal Press, 1966; a method described in P.Glafkides, "Chimie et Physique Photographique", Paul Montel, 1967; and a method described in V.L. Zelikan et al., "Making and Coating Photographic Emulsion", Focal Press, 1964.

In the invention, a silver halide emulsion can be prepared while keeping the mixture of ingredients neutral (the neutral method), acidic (the acid method) or ammoniac (the ammonia method). The mixing of the ingredients may be performed by the single-jet method, the reverse-jet method, the double-jet method or the controlled double-jet method. Growing grains may be performed by the conversion method, the core/shell method, or the like.

In a preferred embodiment of the invention, a silver halide emulsion is one that consists of monodispersed silver iodobromide grains in each of which silver iodide is localized in the interior portion.

An emulsion disclosed in Japanese Patent Publication Open to Public Inspection (hereinafter referred to as Japanese Patent O.P.I. Publication) Nos. 177535/1984, 802237/1986, 132943/1986 and 49751/1988, i.e., an emulsion consisting of monodispersed grains in each of which silver iodide is localized in the interior portion, can be employed preferably in the invention. The shape of a silver halide crystal may be cubic, tetradecahedral or octahedral. A crystal having the {1,1,1} face and the {1,0,0} face in combination may also be used.

Monodispersed silver halide grains are defined as grains, at least 95% (by weight cut) of which having sizes falling within the range of 60 to 140% (preferably 70 to 130%) of the average grain size (see Japanese Patent O.P.I. Publication No. 162244/1985). The variation coefficient of such grains is 0.20 or less. In the invention, polydispersed silver halide grains are also usable.

In order to attain a higher contrast even when sensitizing paper is applied only to one side of the light-sensitive material, it is preferable to employ silver halide grains with a silver iodide content of 2.5 mol% or less, a silver bromide content of 95.5 mol% or less and a variation coefficient of 0.30 or less.

With regard to the mono-dispersed emulsion of a core/shell type, it is preferable that silver iodides in quantity of 60% or more of the total silver iodides contained in a total grain are contained in the inside portion of the grain corresponding to 30% of the grain volume.

The preferable grain of the mono-dispersed emulsion of a core/shell type includes a normal crystal cube, a tetradecahedron, an octahedron, a sphere-shaped grain having both a {1,1,1} plane and a {1,0,0} plane together, or a tabular twin crystal wherein 50% or more of the projected area is of an aspect ratio ranging from 3 to 15.

The aspect ratio in the invention means one obtained through a method described in Japanese Patent Application No. 99345/1989.

The interior portion and exterior portion of a grain may differ in halide composition. In the invention, a core/shell silver halide grain having a high-chloride interior portion (core) and a low-chloride exterior portion (shell) is preferable.

The silver iodide content of the core should preferably be 10-40 mol%, more preferably 20-30 mol%. An emulsion comprising such core/shell type grains can be prepared by a known method (see J. Phot. Sci., Vol.12, 1963, pages 242 to 251, Japanese Patent O.P.I. Publication Nos. 36890/1973, 16364/1977, 142329/1980, 49938/1983, British Patent No. 1,413,748, U.S. Patent Nos. 3,574,628 and 3,655,394).

In the invention, a monodispersed emulsion obtained by using seed grains as growth nuclei is preferable. Formation of core/shell grains is described in detail in British Patent No. 1,027,146, U.S. Patent Nos. 3,505,068, 4,444,877 and Japanese Patent O.P.I. Publication No. 14331/1985.

In the invention, it is preferred that the project area of tabular silver halide grains with an average aspect ratio of 3 to 15 account for 50% or more of the total project area of silver halide grains.

Tabular grains have such a merit that the amount of cross over light can be adjusted only by controlling the amount of a spectral sensitizing dye.

Other advantages of using tabular grains include the improvement of spectral sensitization efficiency as well as increased graininess and sharpness of an image. Tabular silver halide grains can be prepared by methods described in British Patent No. 2,112,157, U.S. Patent Nos. 4,439,520, 4,433,048, 4,414,310, 4,434,226, Japanese Patent O.P.I. Publication Nos. 113927/1983, 127921/1983, 138342/1988, 284272/1988 and 305343/1988.

Silver halide grains may be such that a latent image is formed mainly in the inside or on the surface. Silver halide grains may be doped with a cadmium salt, a zinc salt, a lead salt, a thallium salt, an iridium salt or a metal complex of iridium, a rhodium salt or a metal complex of rhodium, and an iron salt or a metal complex of iron, during physical ripening or grain growth. Silver halide grains may be rinsed to remove unnecessary soluble salts by the conventional noodle washing method or by the flocculation method. For desalting, it is preferable to employ a sulfo group-containing aromatic hydrocarbon-based aldehyde resin disclosed in Japanese Patent Examined Publication No. 16086/1960 or high molecular flocculating agents (example compound Nos. G3 and G8) disclosed in Japanese Patent O.P.I. Publication No. 158644/1988. During the step of physical ripening or chemical ripening, various additives may be added to a silver halide emulsion. Examples of usable additives include compounds described in Research Disclosure No. 17643 (December 1978), No. 18716 (November 1979) and No. 308119 (December 1989). See below.

Additive	RD-17643		RD-18716		RD-308119	
	Page	Classification	Page	Classification	Page	Classification
Chemical sensitizer	23	III	648 upper right		996	III
Sensitizing dye	23	IV	648 to 649		996 to 998	IV
Desensitizing dye	23	IV			998	B
Dye	25 to 26	VIII	649 to 650		1003	VIII
Development accelerator	29	XXI	648 upper right			
Anti-foggant, Stabilizer	24	IV	649 upper right		1006 to 1007	VI
Brightener	24	V			998	V
Hardener	26	X	651 left		1004 to 1005	X
Surfactant	26 to 27	XI	650 right		1005 to 1006	XI
Anti-static agent	27	XII			1006 to 1007	XIII
Plasticizer	27	XII	650 right		1006	XII
Lubricant	27	XII				
Matting agent	28	XVI	650 right		1008 to 1009	XVI
Binder	26	XXII			1003 to 1004	XXII
Support	28	XVII			1009	XVII

As the support, use can be made of substances described in Research Disclosure No. 17643, page 28, and Research Disclosure No. 308119, page 1009.

Suitable supports are plastic films. The surface of the support may be subbed to improve adhesion between the support and other layers, or may be subjected to a corona discharge treatment or a UV ray irradiation treatment.

A light-sensitive material of the invention can also be applied to a light-sensitive material for photographing with a imaging camera used in photographing a hard copy of a medical diagnostic equipment, a light-sensitive material for photographing laser images, and to a light-sensitive material for photofluorography, and it can be provided with an aptitude for high sensitivity and rapid processing, maintaining its image quality which is as good as that of a single-sided emulsion-coated light-sensitive material.

EXAMPLES

The present invention will be described in more detail according to the following examples.

Example 1

Preparation of Silver Halide Emulsion

Silver halide emulsion (A): Comprising silver halide grains with a silver iodide content of 1.4 mol%, a silver bromide content of 98.6 mol%, an average grain size of 1.4 µm, an average thickness of 0.34 µm, and a variation coefficient of 0.23.

Silver halide emulsion (B): Comprising silver halide grains with a silver iodide content of 1.2 mol%, a silver bromide content of 98.8 mol%, an average grain size of 1.2 µm, an average thickness of 0.27 µm, and a variation coefficient of 0.22.

In each of (A) and (B), the project area of tabular grains with an aspect ratio of 3 or more accounted for 90% or more of the total project area of the grains.

The variation coefficient was measured by the method described in Japanese Patent O.P.I. Publication No. 162244/1985.

Preparation, Processing and Evaluation of Sample

Pure water was added to each of emulsions (A) and (B) in an amount of 500 ml per mol silver, and heated to 50 ° C. Then, the following sensitizing dyes A and B were added in amounts of 300 mg and 450 mg, respectively, per mol silver halide. The weight ratio of A and B was 150:1.

Ten minutes later, 4×10^{-3} mol per mol silver of ammonium thiocyanate was added to emulsion (A), and 3×10^{-3} mol per mol silver of ammonium thiocyanate was added to emulsion (B). Further, appropriate amounts of chloroauric acid and sodium thiosulfate were added to proceed chemical ripening.

The chemical ripening was performed at a pH of 6.15 and a silver potential of 80 mV.

Fifteen minutes before the completion of the chemical ripening (70 minutes after the start of the chemical ripening), 300 mg per mol silver of potassium iodide was added. Five minutes later, 10% (wt/vol) of acetic acid was added to lower pH to 5.6. pH was kept at 5.6 for 5 minutes, then a 0.5% (wt/vol) solution of potassium hydroxide was added to raise pH to 6.15. 2,500 g of 4-hydroxy-6-methyl-1,3,3a-tetrazaindene was added to terminate the chemical ripening.

To each of emulsions (A) and (B), the following additives were added to obtain coating liquids (A) and (B).

The pH and silver potential of each coating liquid were adjusted to 6.20 and 80 mV (35 ° C), respectively, by the addition of sodium carbonate and potassium bromide.

Using the so-obtained coating liquids, a light-sensitive material sample was formed by the method described below. The amount of gelatin was adjusted to 2.1 g/m^2 on each of the HS and LS sides. The amount of a silver halide was translated into the amount of silver (see Table 1).

A coating liquid for a protective layer was prepared by using the following additives. The gelatin content of a protective layer was adjusted to 1.20 g/m^2. The HS side, the LS side and the protective layer were formed by applying the coating liquids to a support by means of two slide hopper coaters. The coating liquids were applied to the both sides of the support simultaneously. The coating speed was 85 m/min. The coated support was dried for 2 minutes and 20 seconds, whereby a light-sensitive sample was obtained. The support was made of a 175 µm-thick polyethylene terephthalate film for X-ray photography that had been colored with blue (density: 0.15). The support had been subbed with an aqueous dispersion obtained by diluting a copolymer of glycidyl methacrylate (50 wt%), methyl methacrylate (10 wt%) and butyl methacrylate (40 wt%) with water such that the concentration of the copolymer would be 10 wt%.

Sensitizing Dyes

Sensitizing dye A

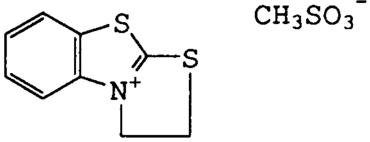
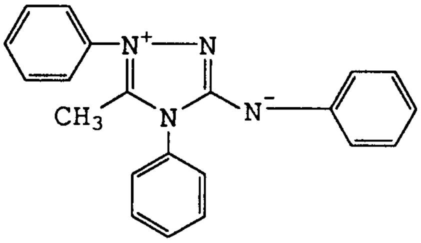
Anhydride of a sodium salt of 5,5'-dichloro-9-ethyl-3,3'-di-(3-sulfopropyl)oxacarbocyanine

Sensitizing dye B

Anhydride of a sodium salt of 5,5'-di-(butoxycarbonyl)-1,1'-diethyl-3,3'-di-(4-sulfobutyl) benzimidazolocarbocyanine

Additives (amount: per mol silver)

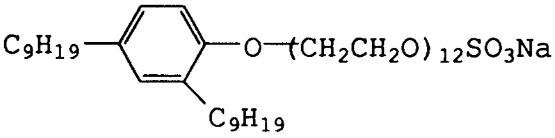
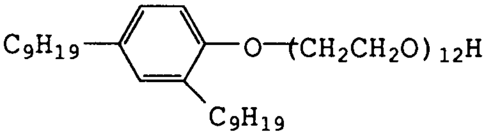
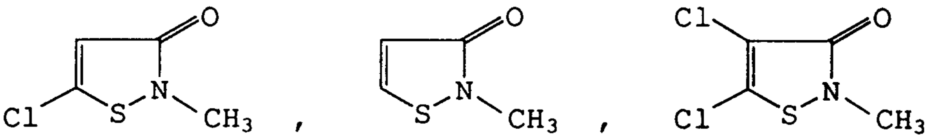
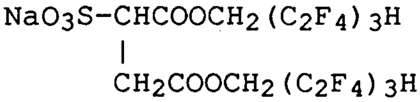
1,1-Dimethylol-1-bromo-1-nitromethane	70 mg
t-Butyl-catechol	400 mg

Polyvinyl pyrrolidone (molecular weight:10,000)	1.0 g
Styrene-maleic anhydride copolymer	2.5 g
Nitrophenyl-triphenyl phosphonium chloride	50 mg
2-Anilino-4,6-dimercaptotriazine	60 mg
Ammonium 1,3-dihydroxybenzene-4-sulfonate	4 g
Sodium 2-mercaptobenzimidazole-5-sulfonate	1.5 mg
$C_4H_9OCH_2CH(OH)CH_2N(CH_2COOH)_2$	1 g
1-Phenyl-5-mercaptotetrazole	15 mg
	70 mg
	150 mg
* (Emulsion of Dye)	1.2 g
** (Dye for Distinguishing HS side from LS side) Added only the LS side of each of film Nos. II to XII shown in Table 1	50 mg

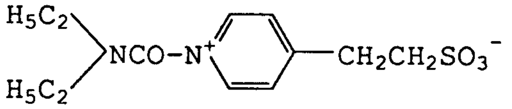
Additives for the Protective Layer

(amount: per liter coating liquid)

Lime-treated inert gelatin	68 g
Acid-treated gelatin	2 g
Sodium-i-amyl-n-decylsulfosuccinate	0.3 g

Polymethyl methacrylate (matting agent with an area average grain size of 3.5 μm)	1.1 g
Silicon dioxide particles (matting agent with an area average grain size of 1.2 μm)	0.5 g
Ludox AM (manufactured by DuPont) (colloidal silica)	30 g
Aqueous 2% solution of a sodium salt of 2,4-dichloro-6-hydroxy-1,3,5-triazine (hardener)	10 ml
Aqueous 40% glyoxal solution (hardener)	1.5 ml
$(CH_2 = CHSO_2CH_2)_2O$ (hardener)	300 mg
	1.0 g
	0.4 g
 (50:46:4)	0.1 g
 $NaO_3S\text{-}\underset{CH_2COOCH_2(C_2F_4)_3H}{\underset{\mid}{C}}HCOOCH_2(C_2F_4)_3H$	0.5 g

$C_{12}H_{25}CONH(CH_2CH_2O)_5H$	2.0 g



100 mg

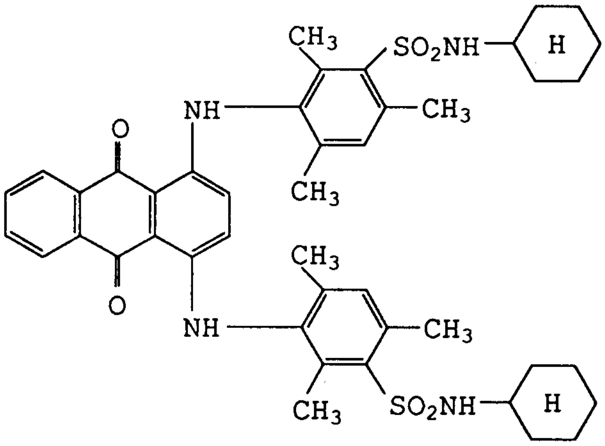
* The dye emulsion was prepared by the following method.

10 kg of each of the following dyes was weighed and dissolved at 55°C in a solvent consisting of 28 l of tricresyl phosphate and 85 l of ethyl acetate. The resulting solution was designated as an oil-based solution. 1.35 kg of an anionic surfactant (AS) was dissolved at 45°C in 27 l of an aqueous 9.3% gelatin solution. The resulting solution was designated as a water-based solution.

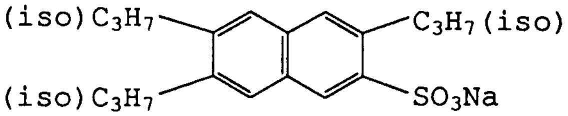
The above solutions were put in a dispersion mixer, and dispersed while keeping the liquid temperature at 40°C.

To the resulting dispersion, 8 g of the following additive (C), 16 l of a 2.5% aqueous phenol solution and water were added, whereby the total quantity was made up to 240 kg. Then, the dispersion was cooled and solidified.

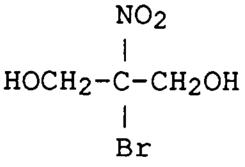
(Dye)



(AS)



(C)

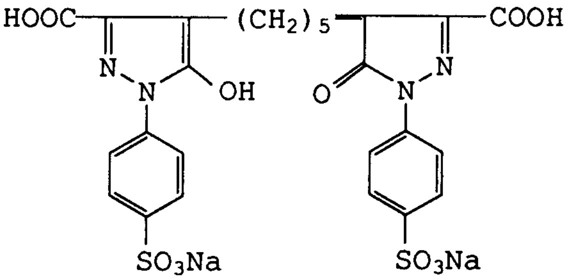


$$HOCH_2-\overset{\overset{NO_2}{|}}{\underset{\underset{Br}{|}}{C}}-CH_2OH$$

The area average grain size of the dispersion was in the range of 0.12 to 0.14 µm.

** Dye for Distinguishing the HS side from the LS side

The following dye was used in the form of an aqueous solution of bluish green, which is the color complementary to red.



A sheet of fluorescent sensitizing paper to be applied to the back of a light-sensitive material for X-ray photography (SRO-250, manufactured by Konica Corp.) was brought into contact with the high-speed emulsion side (side A) of sample No.1. The sample was then exposed to X-ray, and processed according to the method described below. The processed sample was designated as 1-I. Another sheet of the same sensitizing paper was applied to the low-speed emulsion side (side B) of sample No. 1, and the resultant was exposed to X-ray, and processed according to the method described below. The processed sample was designated as 1-II.

On the side where no sensitizing paper was applied, a black coating layer which absorbs light well was provided.

X-ray exposure was performed for 0.08 second at 20 mA and 80 KVP (tube voltage). A sensitometry curve was formed by the distance method, and from this curve, sensitivity, maximum density and gamma value were obtained.

Meanwhile, processing was performed by means of an automatic developing machine (SRX-502, manufactured by Konica Corp.), and a developer and a fixer of the following compositions. The developing temperature and the fixing temperature were 35 ° C and 33 ° C, respectively. Rinsing was conducted by supplying 5 l per minute of 18 ° C water. The entire course of the processing was completed within 45 seconds.

The sensitivity of the A side was obtained by removing the emulsion layer from the B side of sample 1-I with a protein decomposing enzyme. Similarly, the sensitivity of the B side was obtained by removing the emulsion layer from the A side of sample 1-II.

Sensitivity was defined as the reciprocal of the amount of X-ray necessary to obtain a density which is represented by:

$$(\text{Max. density} - \text{fogging density} \times 0.4) + \text{fogging density}$$

Sample No. 1 had the same emulsion layer structure as that of ordinary double-sided X-ray films, and hence, fluorescent sensitizing paper was applied to the both side thereof.

The gradient (system gamma) was calculated from the reciprocal of numerical value obtained by multiplying the difference of cologarithms of X-ray dosages causing respectively (fog + 0.25 density) and (fog + 2.0 density) by 1/(2.00 - 0.25).

Each of sample Nos. 1 to 20 was evaluated for sharpness by the following method.

Sample Nos. 2 to 20 were prepared in substantially the same manner as in the preparation of sample No. 1, except that the type of film was varied to those shown in Table 2. Each sample was brought into contact with sensitizing paper. The type of sensitizing paper and the manner of combination of two sheets of sensitizing paper are as shown in Table 2. Using each sample, a Funk test chart (SMS5853, sold by Konica Medical Corp.) was photographed. The tube voltage was 80KVP. After exposure, each sample was processed in the same way as mentioned above.

The amount of X-ray was adjusted such that the average density of light and shade formed in the photograph would be 0.8 ± 0.02.

Composition of Developer

Potassium sulfite	60.0 g
Hydroquinone	25.0 g
1-Phenyl-3-pyrazolidone	1.5 g
Boric acid	10.0g
Potassium hydroxide	23.0 g
Triethylene glycol	17.5 g
5-Methylbenztriazole	0.04 g
5-Nitrobenzimidazole	0.11 g
1-Phenyl-5-mercaptotetrazole	0.015 g
Glacial acetic acid	16.0g
Potassium bromide	4.0 g
Water was added to make the total quantity 1 l.	

Composition of Fixer

Sodium thiosulfate	45 g
Disodium ethylenediaminetetraacetate	0.5 g
Ammonium thiosulfate	150 g
Sodium sulfite an hydride	8 g
Potassium acetate	16 g
Aluminum sulfate 18 hydrate	27 g
Sulfuric acid (50 wt%)	6 g
Citric acid	1 g
Boric acid	7 g
Glacial acetic acid	3 g
Water was added to make the total quantity 1 l, and pH was adjusted to 4.6 with glacial acetic acid (25° C).	

The developer and fixer were put in the automatic developing machine 24 hours after the preparation.

Evaluation of Sharpness

Evaluated according to the following criteria:

A: Recognizable to 10LP with a magnifier
B: Recognizable to 8LP with a magnifier
C: Recognizable to 6LP with a magnifier
D: Recognizable to 5LP with a magnifier
E: Recognizable to 5LP with a magnifier

Evaluation of Graininess

Acrylic beads (diameter: 3 mm) and aluminum balls (diameter: 3 mm) were brought into close contact with each stage of a 20-stage aluminum penetrometer, and photographing was performed using each sample at a tube voltage of 90KVP. Then, the samples were processed in the same way as mentioned above. The graininess of an image in the density area of 0.5 to 1.2 (a density range where graininess can be observed most readily) was examined visually.

A: Excellent
Graininess comparable with that of sample No. 1 in Table 2
B: Fair
Graininess slightly lower than that of sample No. 1
C: Slightly poor
Graininess equivalent to that of sample No. 5 (a high-contrast double-sided film was used)
D: Poor

The acrylic beads with almost uniform densities could not be recognized readily, but the aluminum balls differing greatly in density could be recognized readily.
E: Practically unusable
The aluminum balls could not be recognized.

The details of the coating films are shown in Table 1.

Table 1

Coating film No.	Emulsion layer structure of the HS side			Emulsion layer structure of the LS side			(S_L'/S_L)	(S_H'/S_H)	Remarks
	Emulsion	Silver content (g/m^2)	Max. density	Emulsion	Silver content (g/m^2)	Max. density			
I	A50% B50%	1.8	1.73	A50% B50%	1.8	1.73	28%	28%	Comparative
II	A50% B50%	2.4	2.26	A50% B50%	2.4	2.26	22%	22%	Comparative
III	A	2.9	2.48	B	1.7	1.74	21%	28%	Comparative
IV	A	3.1	2.61	A	1.8	1.61	19%	30%	Inventive
V	B	1.7	1.75	A	1.7	1.52	29%	32%	Comparative
VI	A	2.5	2.17	A	2.3	2.02	24%	26%	Inventive
VII	A	2.5	2.17	B	2.0	2.04	24%	26%	Comparative
VIII	B	2.1	2.14	A	1.5	1.38	24%	38%	Inventive
IX	A50% B50%	1.9	1.84	A	1.5	1.38	26%	38%	Comparative
X	A50% B50%	2.2	2.09	A	1.7	1.53	25%	34%	Inventive
XI	A50% B50%	2.2	2.09	A	1.5	1.38	25%	38%	Inventive
XII	B	2.1	2.14	A50% B50%	1.3	1.30	24%	40%	Comparative

The coating films had the following photographic properties.

Coating film No. I

The HS and LS sides did not differ in emulsion layer properties and each had a relative sensitivity of 88.
G_H (the gradient of a straight line connecting a fogging density + 0.5 and a fogging density + 1.3): 1.29
G_L (the gradient of a straight line connecting a fogging density + 0.3 and a fogging density + 0.6): 1.21
The density of the LS side after exposing the HS side to X-ray in an amount that would make the density of the HS side after processing higher than the fogging density by 1.1: fogging density + 0.29

Coating film No. II

The HS and LS sides did not differ in emulsion layer properties and each had a relative sensitivity of 85.
G_H (the gradient of a straight line connecting a fogging density + 0.5 and a fogging density + 1.3): 1.75
G_L (the gradient of a straight line connecting a fogging density + 0.3 and a fogging density + 0.6): 1.51
The density of the LS side after exposing the HS side to X-ray in an amount that would make the density of the HS side after processing higher than the fogging density by 1.1: fogging density + 0.25

Coating film No. III
The HS and LS sides differed in emulsion layer properties and had relative sensitivities of 95 and 68, respectively.
G_H (the gradient of a straight line connecting a fogging density + 0.5 and a fogging density + 1.3) of the HS side: 1.95
G_L (the gradient of a straight line connecting a fogging density + 0.3 and a fogging density + 0.6) of the LS side: 1.30
The density of the LS side after exposing the HS side to X-ray in an amount that would make the density of the HS side after processing higher than the fogging density by 1.1: fogging density + 0.06

Coating film No. IV

The HS and LS sides differed in emulsion layer properties and had relative sensitivities of 97 and 103, respectively.
G_H (the gradient of a straight line connecting a fogging density + 0.5 and a fogging density + 1.3) of the HS side: 2.05
G_L (the gradient of a straight line connecting a fogging density + 0.3 and a fogging density + 0.6) of the LS side: 1.25
The density of the LS side after exposing the HS side to X-ray in an amount that would make the density of the HS side after processing higher than the fogging density by 1.1: fogging density + 0.08

Coating film No. V

The HS and LS sides differed in emulsion layer properties and had relative sensitivities of 68 and 104, respectively.
G_H (the gradient of a straight line connecting a fogging density + 0.5 and a fogging density + 1.3) of the HS side: 1.28
G_L (the gradient of a straight line connecting a fogging density + 0.3 and a fogging density + 0.6) of the LS side: 1.20
The density of the LS side after exposing the HS side to X-ray in an amount that would make the density of the HS side after processing higher than the fogging density by 1.0: fogging density + 0.33

Coating film No. VI

The HS and LS sides differed in emulsion layer properties and had relative sensitivities of 99 and 104, respectively.
G_H(the gradient of a straight line connecting a fogging density + 0.5 and a fogging density + 1.3) of the HS side: 1.75
G_L (the gradient of a straight line connecting a fogging density + 0.3 and a fogging density + 0.6) of the LS side: 1.65

The density of the LS side after exposing the HS side to X-ray in an amount that would make the density of the HS side after processing higher than the fogging density by 1.1: fogging density + 0.99

Coating film No. VII

The HS and LS sides differed in emulsion layer properties and had relative sensitivities of 99 and 66, respectively. G_H (the gradient of a straight line connecting a fogging density + 0.5 and a fogging density + 1.3) of the HS side: 1.75
G_L (the gradient of a straight line connecting a fogging density + 0.3 and a fogging density + 0.6) of the LS side: 1.45
The density of the LS side after exposing the HS side to X-ray in an amount that would make the density of the HS side after processing higher than the fogging density by 1.1: fogging density + 0.05

Coating film No. VIII

The HS and LS sides differed in emulsion layer properties and had relative sensitivities of 68 and 105, respectively.
G_H (the gradient of a straight line connecting a fogging density + 0.5 and a fogging density + 1.3) of the HS side: 1.75
G_L (the gradient of a straight line connecting a fogging density + 0.3 and a fogging density + 0.6) of the LS side: 1.15
The density of the LS side after exposing the HS side to X-ray in an amount that would make the density of the HS side after processing higher than the fogging density by 1.1: fogging density + 0.05

Coating film No. IX

The HS and LS sides differed in emulsion layer properties and had relative sensitivities of 88 and 105, respectively.
G_H (the gradient of a straight line connecting a fogging density + 0.5 and a fogging density + 1.3) of the HS side: 1.38
G_L (the gradient of a straight line connecting a fogging density + 0.3 and a fogging density + 0.6) of the LS side: 1.15
The density of the LS side after exposing the HS side to X-ray in an amount that would make the density of the HS side after processing higher than the fogging density by 1.1: fogging density + 0.19

Coating film No. X
The HS and LS sides differed in emulsion layer properties and had relative sensitivities of 87 and 103, respectively.
G_H (the gradient of a straight line connecting a fogging density + 0.5 and a fogging density + 1.3) of the HS side: 1.51
G_L (the gradient of a straight line connecting a fogging density + 0.3 and a fogging density + 0.6) of the LS side: 1.15
The density of the LS side after exposing the HS side to X-ray in an amount that would make the density of the HS side after processing higher than the fogging density by 1.1: 0.17

Coating film No. XI

The HS and LS sides differed in emulsion layer properties and had relative sensitivities of 87 and 103, respectively.
G_H (the gradient of a straight line connecting a fogging density + 0.5 and a fogging density + 1.3) of the HS side: 1.51
G_L (the gradient of a straight line connecting a fogging density + 0.3 and a fogging density + 0.6) of the LS side: 1.15
The density of the LS side after exposing the HS side to X-ray in an amount that would make the density of the HS side after processing higher than the fogging density by 1.1: fogging density + 0.17

Coating film No. XII

The HS and LS sides differed in emulsion layer properties and had relative sensitivities of 66 and 105, respectively.

G_H (the gradient of a straight line connecting a fogging density + 0.5 and a fogging density + 1.3) of the HS side: 1.75

G_L (the gradient of a straight line connecting a fogging density + 0.3 and a fogging density + 0.6) of the LS side: 0.85

The density of the LS side after exposing the HS side to X-ray in an amount that would make the density of the HS side after processing higher than the fogging density by 1.1: fogging density + 0.15

Using these films and fluorescent paper in combination (see Table 2), measurement of sensitivity and contrast was conducted.

SRO-125, SRO-250 and SRO-500 (fluorescent intensifying screen sold by Konica Corp.) are available in a set of intensifying screen for the front and that for the back. In film Nos. I and II shown in Table 1 (both sides of the support have the same properties), the front side of the film was brought into contact with intensifying screen for the front, and the back side of the film was brought into contact with intensifying screen for the back. In film Nos. III to XII (the two sides of the support differed in properties), each side of the film was brought into contact with intensifying screen for the back.

<Measurement of System Sensitivity and System Gamma>

One or each side of the sample was brought into contact with intensifying screen.

Sensitivity was defined as the reciprocal of the amount of X-ray necessary for obtaining a fogging density + 1.0, and expressed as a value relative to that of sample 1 in Table 2, which was set as 80. The gradient (system gamma) was calculated from the reciprocal of numerical value obtained by multiplying the difference of cologarithms of X-ray dosages causing respectively (fog + 0.25 density) and (fog + 2.0 density) by 1/(2.00 - 0.25).

<Measurement of S_L', S_L, S_H' and S_H>

The sensitivity of the LS side obtained when exposure is conducted from the HS side through fluorescent intensifying screen (S_B') and the sensitivity of the LS side obtained when exposure is conducted from the LS side through fluorescent intensifying screen (S_B) were each obtained by removing the sensitive layer from the HS side with a protein decomposing enzyme. The sensitivity of the HS side obtained when exposure is conducted from the LS side through fluorescent intensifying screen (S_H) and the sensitivity of the LS side obtained when exposure is conducted from the HS side through intensifying screen (S_H) were each obtained by removing the sensitive layer from the LS side with a protein decomposing enzyme.

S_L', S_L and S_H were each defined as the reciprocal of the amount of X-ray needed to obtain a density which is defined as:

(Max. density - fogging density) × 0.4 + fogging density.

As for film Nos. I and II (the two sides of the support have the same properties), the system gamma was defined as the doubled difference between the logarithm of the reciprocal of the amount of X-ray that gave a fogging density + 0.8 and the logarithm of the reciprocal of the amount of X-ray that gave a fogging density + 1.3.

The results obtained are shown in Table 2.

Table 2

Sample No	Film employed	Emulsion of the front	Emulsion of the back	Sensitizing paper of the front	Sensitizing paper of the back	System sensitivity	System gamma	Visually observed graininess, density area from 0.5 to 1.2	Visually observed sharpness, Funk chart	Remarks
1	I	LS	HS	SRO-250	SRO-250	80	2.30	A	D	Comparative
2	I	LS	HS	SRO-500	SRO-500	160	2.30	C	E	Comparative
3	I	LS	HS	SRO-125	SRO-500	158	2.15	B	D	Comparative
4	I	LS	HS		SRO-250	61	2.05	C	C	Comparative
5	II	LS	HS	SRO-250	SRO-250	110	2.80	C	C	Comparative
6	III	LS	HS		SRO-250	99	2.00	D	A	Comparative
7	III	LS	HS	SRO-125	SRO-500	206	2.60	D	B	Comparative
8	III	LS	HS	SRO-250	SRO-250	125	2.75	B	C	Comparative
9	III	HS	LS	SRO-125	SRO-500	155	2.20	C	B	Comparative
10	IV	LS	HS		SRO-250	100	2.35	C	A	Inventive
11	IV	LS	HS	SRO-125	SRO-500	208	2.85	B	B	Inventive
12	IV	LS	HS	SRO-250	SRO-250	126	3.00	A	C	Inventive
13	IV	HS	LS	SRO-125	SRO-500	155	2.55	A	B	Inventive
14	V	HS	LS	SRO-125	SRO-500	102	2.05	A	D	Comparative
15	VI	LS	HS		SRO-250	98	2.05	C	A	Inventive
16	VI	HS	LS	SRO-125	SRO-500	160	2.70	A	B	Inventive
17	VII	HS	LS	SRO-125	SRO-500	142	2.35	B	D	Comparative
18	VIII	HS	LS	SRO-125	SRO-500	151	2.35	A	C	Inventive
19	IX	HS	LS	SRO-125	SRO-500	148	2.25	A	D	Comparative
20	X	HS	LS	SRO-125	SRO-500	158	2.45	A	B	Inventive
21	XI	HS	LS	SRO-125	SRO-500	152	2.35	A	C	Inventive
22	XII	HS	LS	SRO-125	SRO-500	137	1.85	A	D	Comparative

As is apparent from Table 2, when intensifying screen was applied only to the HS side of the sample of the invention, an image with improved sharpness could be obtained. When high-speed intensifying screen and low-speed intensifying screen were applied to the HS side and the LS side of the sample of the invention, respectively, improvements were made in sharpness, graininess and sensitivity. If low-speed intensifying screen was applied to the LS side, and high-speed intensifying screen or the low-intensifying screen was applied to the HS side, respectively, of the sample of the invention, a high-contrast image with improved graininess and sharpness could be obtained.

In the case of sample No. 14 which was obtained by using film No. V (the maximum density of the HS side was below 1.80), the sharpness of an image in a density area of 1.6 or higher was poor when intensifying screen was applied only to the HS side. As compared with sample No. 18 which was obtained by using film No. VIII (the maximum density of the HS side was 1.80 or more), sample No. 18 had poor sharpness in a density area of 1.7 or more.

When intensifying screen was applied only to the HS side of sample No. 6 which had been obtained by using film No. III, a sufficient density was hardly formed on the LS side due to poor sensitivity of the LS side. That is, the density of a high-density area formed on the LS side was decreased, and, as a result, the contrast in a density area of 1.7 or more was lowered. In the case of film No. VII in which the HS side had a higher sensitivity, the contrast in a density area of 1.8 or more was lowered when intensifying screen was applied only to the HS side.

Sample No. 19, though being a sample of the invention, had such a disadvantage that the contrast of the HS side was low. Therefore, when high-speed sensitizing paper and low-speed intensifying screen were applied to the LS side and the HS side, respectively, this sample produced an image which lacked sharpness due to poor contrast in a density area of 1.2 or less.

In each of film Nos. III to XII (the two sides of the support had different emulsion layer structures), a dye (described before) to make the LS side distinguished from the HS side under safe light in a dark room was added to the LS side. Under Highlight (safe light manufactured by Konica Corp.), the LS side appeared black, thus enabling the LS side to be distinguished from the HS side.

According to the present invention, X-ray photographs differing in contrast can be obtained with one and the same light-sensitive material only by changing the type of intensifying screen or the manner of combination of two sheets of sensitizing paper differing in luminescence. Therefore, the use of the light-sensitive material of the present invention eliminates the necessity of keeping various kinds of light-sensitive material to meet various needs, thus enabling investment control to be performed more readily and minimizing the possibility of misapplication of a film.

Claims

1. A silver halide photographic light-sensitive material comprising a support and an first emulsion layer (the HS layer) having a first maximum density on one side of a support and an second emulsion layer (the LS layer) on the other side of a support having a said second maximum density which second maximum density is lower than first maximum density, wherein the HS layer has a maximum density of 1.80 or more, when exposure is performed on the HS layer such that the density of the HS layer after processing is a fogging density + 1.10, the density of the LS layer is a fogging density + 0.20 or low, and when exposure is performed on the HS layer, the gradient of a straight line connecting a fogging density + 0.5 and a fogging density + 1.3 in the characteristics curve for the HS layer is within the range of 1.50 to 2.90; and when exposure is performed from the LS layer, the gradient of a straight line connecting a fogging density + 0.3 and a fogging density + 0.6 in the characteristic curve for the LS layer is not less than 1.10, and the sensitivity of the HS layer (S_H) is lower than that of the LS layer (S_L) wherein each of S_H and S_L is the reciprocal of an amount of exposure needed to obtain a density represented by the following formula:

   [(Maximum density - fogging density) × 0.4] + fogging density.

2. The silver halide photographic light-sensitive material of claim 1, wherein a ratio (S_L'/S_L) of the sensitivity (S_L') of the LS layer obtained when exposure is performed on the HS layer through fluorescent intensifying screen to that (S_L') of the LS layer obtained when exposure is performed from the LS layer through fluorescent intensifying screen is not less than 0.12.

3. The silver halide photographic light-sensitive material of claim 2, wherein a ratio (S_L'/S_L) of the sensitivity (S_L') of the LS layer obtained when exposure is performed on the HS layer through fluorescent intensifying screen to that (S_L') of the LS layer obtained when exposure is performed from the LS layer through fluorescent intensifying screen is not less than 0.12, and a ratio (S_H'/S_H) of the sensitivity of the LS layer fluorescent intensifying screen (S_H') to that of the HS layer obtained when exposure is performed from the HS layer through fluorescent intensifying screen (S_H') is not more than 0.35.

4. The silver halide photographic light-sensitive material of claim 2, wherein, when exposure is performed with fluorescent intensifying screen being applied only to the HS layer, in the combined characteristic curve for the HS and LS layers, the gradient of a straight line connecting a fogging density + 0.25 and a fogging density + 2.0 (G_w) is within the range from 2.10 to 2.90.

5. A image forming method for a silver halide photographic material of claim 2, wherein exposure is performed with fluorescent intensifying screen being applied only to the HS layer.

6. The method for a silver halide photographic material of claim 1 or claim 2, wherein exposure method is performed with a sheet of fluorescent intensifying screen being applied to each of the HS and LS layer of said silver halide photographic light-sensitive material.

7. The method for a silver halide photographic material of claim 3, wherein exposure is performed with high-speed fluorescent intensifying screen and low-speed fluorescent intensifying screen being applied to the HS layer and the LS layer, respectively of said silver halide photographic light-sensitive material.

8. The method for a silver halide photographic material of claim 3, wherein exposure is performed with high-speed fluorescent intensifying screen being applied to the LS layer and low-speed fluorescent intensifying screen being applied to the HS layer of said silver halide photographic light-sensitive material.

9. A silver halide photographic light-sensitive material of claim 1, 2 or 4, wherein each of the HS and LS layers contains an emulsion layer in which the project area of tabular silver halide grains with an aspect ratio of 3 or more which accounts for 50 % or more of the total project area.

10. The silver halide photographic light-sensitive material of claim 4, wherein, when a fluorescent intensifying screen containing gadolinium sulfaoxide:terbium (Gd_2O_2S:Tb) is used as a fluorescent body, the S_L'/S_L ratio is not less than 0.12 and the S_H'/S_H ratio is not more than 0.35.

11. The silver halide photographic light-sensitive material of claim 4, wherein the sensitivity (S_L) of the LS layer is 1.05 to 1.90 times as high as that (S_H) of the HS layer.

12. A silver halide photographic light-sensitive material comprising at least one light-sensitive silver halide emulsion layer provided on both sides of the support, and the photographic property on one side of the support is different from the photographic property on the other side of the support and at least one light-sensitive silver halide emulsion layer provided on one side of the support contains a material exhibiting a higher absorption to 560-700 nm than to 545 nm.