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(54) Light-sensitive silver halide photographic materials.

(57) Light-sensitive silver halide photographic materials are disclosed comprising a support and silver halide emulsion layer or layers, wherein at least one of said silver halide emulsion layers contains tabular silver halide grains having an average diameter-thickness ratio of at least 3:1 and at least one mercury compound in an effective speed incresing amount.

The light-sensitive materials can be advantageously used in high temperature processing and have increased photographic speed without serious fog problems.

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FIELD OF THE INVENTION

This invention relates to light-sensitive silver halide photographic materials and, more particularly, to light-sensitive silver halide photographic materials comprising tabular silver halide grains.

BACKGROUND OF THE INVENTION

Tabular silver halide grains are crystal possessing two major faces that are substantially parallel in which the average diameter of said faces is at least three times (and often more times) the distance separating the faces.

Silver halide photographic emulsions containing a high proportion of tabular grains have advantages of good developability, improved covering power and increased useful adsorption of sensitizing dye per weight of silver due to their high surface area-to-volume ratio. The use of such emulsions in photographic materials is disclosed in US Pat. Nos. 4,425,425, 4,433,048, 4,435,499, 4,439,520, and other related patents.

However, photographic materials containing tabular silver halide grains also have certain disadvantages. One of these is that they tend to easily fog under high temperature accelerated processing. Therefore, tabular silver halide grains are not satisfactory for use in photographic emulsions required to have high sensitivity and low fog.

It is known to incorporate various additives, such as stabilizers and antifoggants, in ordinary light-sensitive silver halide photographic materials for minimizing the rise of fog in dependence of the development processing conditions. For example, nitrobenzimidazoles, mercaptothiazoles, benzotriazoles, nitrobenzotriazoles, mercaptotetrazoles, etc., are described as such additives in E.J. Birr, Stabilization of Photographic Silver Halide Emulsions, Focal Press, and in US Pat. Nos. 3,954,474, 3,982,974, etc. However, while these additives can depress an increase of fog in a light-sensitive silver halide photographic material containing tabular grains during high temperature processing to some extent, a remarkable decrease in sensitivity cannot be prevented.

For example, it is known to use light-sensitive silver halide photographic materials in high-temperature development processing using automatic developing machines. In order to enhance the physical strength of the photographic materials during the development at high temperature and in automatic developing machines and prevent them from becoming physically fragile it is known to conduct the processing with an aldehyde hardener in the developing solution. However, a developing process with a developing solution containing an aldehyde, particularly an aliphatic dihaldehyde, concurrently causes an increase of fog, particularly as the temperature of the developing solution increases. The fog can be depressed to some extent by using strong antifogging agents such as benzotriazoles and 1-phenyl-5-mercaptotetrazoles in the developing solutions (as described in L.F. Mason, Photographic Processing Chemistry, Focal Press). However, these antifogging agents, when used to develop light-sensitive silver halide photographic materials containing tabular silver halide grains, concurrently depress development and reduce photographic speed.

US Patent No. 2,728,664 describes the use of mercury compounds to retard or eliminate fog formation in silver halide photographic emulsions.

In practice, the use of mercury compounds as antifoggants has not been completely satisfactory. It has been observed that mercury compounds, while acting as antifoggant and stabilizers, also reduce the photographic speed of silver halide emulsions containing such compounds. Attempts to reduce the amount of mercury compound for the purpose of lowering speed loss results in lowered antifogging action.

US Patent No 2,728,663 describes molecular compounds of mercuric salts with amines or salts of amines to stabilize photographic speed and mantain fog at low level when the photographic material is storaged under tropical or dry conditions at high temperatures. No increase of photographic speed with the addition of mercury compounds is reported.

FR Patent 2,084,668 describes the antifogging action of mercury compounds during the preparation of converted silver halide photographic emulsions.

US Patent No. 3,615,620 discloses the use of mercury oxides to suppress fog formation in silver halide photographic emulsions. However, a concomitant loss of speed is still observed.

US Patent No. 4,885,233 describes a combination of mercury compounds and certain benzothiazolium compounds to reduce chemical fog of silver halide photographic emulsions without adverse loss of photographic speed. The combination is particularly described for use in color photographic films including dye image-forming coupler compounds and cubic silver halide grains.

Nothwistanding the foregoing publications, the problem still remains of preventing fog formation in silver halide photographic emulsions containing tabular silver halide grains without adversely reducing photographic speed but, on the contrary, increasing such speed.

SUMMARY OF THE INVENTION

The present invention describes a light-sensitive silver halide photographic material comprising a support and silver halide emulsion layer or layers, wherein at least one of said silver halide emulsion layers contains tabular silver halide grains having an average diameter:thickness ratio of at least 3:1 and at least one mercury compound in an amount effective to increase photographic speed.

The light-sensitive material of this invention can be advantageously used in high temperature processing and has increased photographic speed without serious fog problems.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a light-sensitive silver halide photographic material comprising a support and silver halide emulsion layer or layers, wherein at least one of said silver halide emulsion layers contains tabular silver halide grains having an average diameter:thickness ratio of at least 3:1 and at least one mercury compound in an amount effective to increase photographic speed.

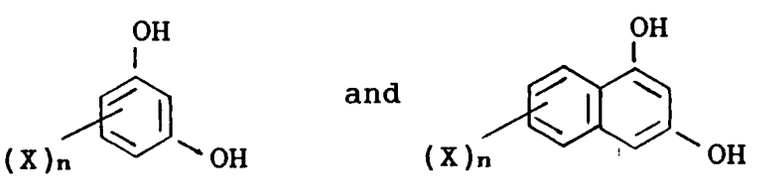
In particular, the present invention relates to a light-sensitive silver halide photographic material comprising a support and silver halide emulsion layer or layers free of latent image, wherein at least one of said silver halide emulsion layers contains tabular silver halide grains having an average diameter:thickness ratio of at least 3:1 and at least one mercury compound in an amount effective to increase photographic speed.

Mercury compounds which may be used for the purposes of this invention include mercury halides, e.g. mercuric chloride, mercurous chloride, mercuric bromide, mercurous bromide, mercuric iodide and mercurous iodide, and mixed halides, e.g. mercuric bromoiodide or bromochloride, mercuric oxide, mercuric nitrate, mercurous nitrate, mercuric sulfate, mercurous sulfate, organic salts of mercury, e.g. mercuric acetate, mercurous acetate, mercurous formate, mercuric oxalate, mercurous oxalate, and complexes formed with an excess of acid anions, e.g. $K_2Hg(CN)_4$ and K_2HgBr_4. Owing to their solubility, the mercury halides are preferred.

The mercury compounds can be incorporated into the silver halide emulsion containing tabular silver halide grains during preparation thereof, preferably during chemical digestion, or can be added to said emulsion immediately prior to coating said emulsion onto a photographic support. The mercury salts can also be incorporated into a hydrophilic colloid layer of the light-sensitive photographic material having a water-permeable relationship with the silver halide emulsion layer, preferably a layer adjacent the silver halide emulsion layer.

The amount of mercury compounds which is usefully employed in this invention is from about 0.0001 mmole to about 0.01 mmole/mole of silver. Preferably this amount is from about 0.0005 mmole to about 0.005 mmole/mole of silver. Within these limits, it has been surprisingly found that mercury compounds cause a speed increase with a concomitant effective fog reduction when used in light-sensitive silver halide emulsions containing tabular silver halide grains.

The mercury compounds for use in the present invention are preferably added to the tabular silver halide emulsion in the presence of a fog inhibiting amount of a m-dihydroxybenzene compound. m-Dihydroxybenzene compounds for use in the present invention have a formula selected from the group consisting of



wherein X is selected from the group consisting of a sulfo radical having the formula $-SO_3H$, a water-soluble salt of said sulfo radical, a carboxy radical having the formula -COOH, a water-soluble salt of said carboxy radical and a hydrogen atom, and n represents 1 or 2. Water-soluble salts of the m-dihydroxybenzene compounds above include alkali metal salts (e.g., sodium and potassium) and ammonium salts. Illustrative m-dihydroxybenzene compounds that are used in the silver halide emulsion according to this invention include: m-dihydroxybenzene (resorcinol), 3,5-dihydroxybenzene carboxylic acid, 3,5-dihydoxybenzene sulfonic acid, 3,5-dihydoxybenzene sulfonic acid sodium salt, 1,3-dihydroxy-6,7-disulfonaphthalene potassium

salt, and the like.

The m-didydroxybenzene compounds may be incorporated in the silver halide emulsion layer or in a layer of the light-sensitive silver halide photographic material having a water-permeable relationship with the silver halide emulsion layer. Preferably, the m-didydroxybenzene compounds are incorporated in the silver halide emulsion layer containing tabular silver halide grains.

The amount of the subject m-dihydroxybenzene compounds that is used in the silver halide emulsion of the photographic material of this invention in combination with mercury compounds can be widely varied. Generally, about 1 to 300 millimoles of the m-dihydroxybenzene compound per mole of silver halide in the silver halide emulsion layer containing said tabular silver halide grains are utilized, although the preferred concentration range is about 5 to 100 millimoles of the m-dihydroxybenzene compound per mole of silver halide in the silver halide emulsion layer containing said tabular silver halide grains.

The m-dihydroxybenzene compounds of this invention can be added to the silver halide emulsion layer containing said tabular silver halide grains utilizing any of the well-known techniques in emulsion making. For example, they can be dissolved in a suitable solvent and added to the silver halide emulsion, or they can be added to the emulsion in the form of a dispersion similar to the technique utilized to incorporate certain types of color-forming compounds (couplers) in photographic emulsions. Techniques of this type are described in US Pat. Nos. 2,322,027 and 2,801,171. The solvent should be selected so that it has no harmful effect upon the emulsion in accordance with usual practice, and generally, solvents or diluents that are miscible with water are preferred.

The tabular silver halide grains contained in the silver halide emulsion layers of this invention have an average diameter:thickness ratio (often referred to in the art as average aspect ratio) of at least 3:1, preferably 5:1 to 30:1 and more preferably 7:1 to 15:1. Average diameters of the tabular silver halide grains suitable for use in this invention range from about 0.3 to about 5 micrometeres, preferably 0.5 to 3 micrometers, more preferably 0.8 to 1.5 micrometers. The tabular silver halide grains suitable for use in this invention have a thickness of less than 0.4 micrometers, preferably less than 0.3 micrometers and more preferably less than 0.2 micrometers.

The grain characteristics described above of the tabular silver halide grains can be readily ascertained by procedures well known to those skilled in the art. The term "diameter" is defined as the diameter of a circle having an area equal to the projected area of the grain. The term "thickness" means the distance between the two substantially parallel main planes constituting the tabular silver halide grains. From the measure of diameter and thickness of each grain the diameter:thickness of each grain can be calculated, and the diameter:thickness ratios of all tabular grains can be averaged to obtain their average diameter:thickness ratio. By this definition the average diameter:thickness ratio is the average of individual tabular grain diameter:thickness ratios. In practice it is simpler to obtain an average diameter and an average thickness of the tabular grains and to calculate the average diameter:thickness ratio as the ratio of these two averages. Whatever the used method may be, the average diameter:thickness ratios obtained do not significantly differ.

In the silver halide emulsion layer containing tabular silver halide grains of the invention, at least 40% of the silver halide grains are tabular grains having an average diameter:thickness ratio of at least 3:1. More preferably, at least 70% of the silver halide grains are tabular grains having an average diameter:thickness ratio of not less than 3:1. Each of the above proportions, "40%" and "70%" means the proportion of the total projected area of the tabular grains having a diameter:thickness ratio of at least 3:1 to the projected area of all of the silver halide grains in the layer. Other conventional silver halide grain structures such as cubic, orthorhombic, tetrahedral, etc. may make up the remainder of the grains.

In the present invention, commonly employed halogen compositions of the silver halide grains can be used. Typical silver halide include silver chloride, silver bromide, silver iodide, silver chloroiodide, silver bromoiodide, silver chlorobromoiodide and the like. However, silver bromide and silver bromoiodide are preferrd silver halide compositions for tabular silver halide grains with silver bromoiodide containing 0 to 10 mol% silver iodide. The halogen composition of individual grains may be homogeneous or heterogeneous.

Silver halide emulsions containing tabular silver halide grains can be prepared with various processes known in the conventional technology for the preparation of photographic materials. Silver halide emulsions can prepared by the acid process, neutral process or ammonia process. In the stage for the preparation, a soluble silver salt and a halogen salt can be reacted in accordance with the single jet process, double jet process, reverse mixing process or a combination process by adjusting the conditions in the grain formation, such as pH, pAg, temperature, form and scale of the reaction vessel, and the reaction method. A silver halide solvent, such as ammonia, thioethers, thioureas, etc., may be used, if desired, for controlling grain size, form of the grains, particle size distribution of the grains, and the grain-growth rate.

Preparation of silver halide emulsions containing tabular silver halide grains is described, for example,

in de Cugnac and Chateau, "Evolution of the Morphology of Silver Bromide Crystals During Physical Ripening", Science and Industries Photographiques, Vol. 33, No.2 (1962), pp.121-125, in Gutoff, "Nucleation and Growth Rates During the Precipitation of Silver Halide Photographic Emulsions", Photographic Science and Engineering, Vol. 14, No. 4 (1970), pp. 248-257,in Berry et al., "Effects of Environment on the Growth of Silver Bromide Microcrystals", Vol.5, No.6 (1961), pp. 332-336, in US Pat. Nos. 4,063,951, 4,067,739, 4,184,878, 4,434,226, 4,414,310, 4,386,156, 4,414,306 and in EP Pat. Appln. No. 263,508.

In preparing the silver halide emulsions containing tabular silver halide grains, a wide variety of hydrophilic dispersing agents for the silver halides can be employed. Gelatin is preferrred, although other colloidal materials such as gelatin derivatives, colloidal albumin, cellulose derivatives or synthetic hydrophilic polymers can be used as known in the art.

The silver halide emulsions containing tabular silver halide grains used in the present invention can be chemically and optically sensitized with methods well known in the art. The silver halide emulsion layer containing the tabular silver halide grains of this invention can contain other constituents generally used in such products, such as binders, hardeners, surfactants, speed-incresing agents, plasticizers, optical sensitizers, dyes, ultraviolet absorbers, etc., and reference can be made to, for example, Research Disclosure, Vol. 176 (December 1978), pp. 22-28. Ordinary silver halide grains may be incorporated in the emulsion layer containing the tabular silver halide grains as well as in other silver halide emulsion layers of the light-sensitive silver halide photographic material of this invention. Such grains can be prepared by processes well known in the photographic art.

The light-sensitive silver halide photographic material of this invention can be prepared by coating the light-sensitive silver halide emulsion layer or layers and other auxiliary layers on a support. There is no limitation with respect to the support. Examples of materials suitable for the preparation of the support include glass, paper, polyethylene-coated paper, metals, cellulose nitrate, cellulose acetate, polystyrene, polyethylene terephthalate, polyethylene, polypropylene and other well known supports.

The light-sensitive silver halide photographic materials of this invention specifically are applicable to light-sensitive photographic color materials such as color negative films, color reversal films, color papers, etc., as well as black-and-white light-sensitive photographic materials such as X-ray light-sensitve materials, lithographic light-sensitive materials, black-and-white photographic printing papers, black-and-white negative films, etc.

Preferred light-sensitive silver halide photographic materials according to this invention are X-ray light-sensitive materials comprising a silver halide emulsion layer or layers coated on one surface, preferably on both surfaces of a support, preferably a polyethylene terephthalate support, wherein at least one of said silver halide emulsion layers contains tabular silver halide grains having an average diameter:thickness ratio of at least 3:1 and at least one mercury compound. Preferably, the silver halide emulsions are coated on the support at a total silver coverage comprised in the range of 3 to 6 grams per square meter. Usually, the X-ray light-sensitive materials are associated with intensifying screens so as to be exposed to radiation emitted by said screens. The screens are made of relatively thick phosphor layers which transform the X-rays into light radiation (e.g., visible light). The screens absorb a portion of X-rays much larger than the light-sensitive material and are used to reduce the X-ray dose necessary to obtain a useful image. According to their chemical composition, the phosphors can emit radiation in the blue, green or red region of the visible spectrum and the silver halide emulsions are sensitized to the wavelength region of the light emitted by the screens. Sensitization is performed by using spectral sensitizing dyes adsorbed on the surface of the silver halide grains as known in the art.

More preferred light-sensitive silver halide photographic materials according to this invention are X-ray light-sensitive materials which employ one or more high diameter:thickness ratio tabular grain silver halide emulsions or intermediate diameter:thickness ratio tabular grain silver halide emulsions, as disclosed in US Pat. Nos. 4,425,425 and 4,425,426 and in EP Pat. Appln. 84,637.

The exposed light-sensitive materials of this invention can be processed by any of the conventional processing techniques. The processing can be a black-and-white photographic processing for forming a silver image or a color photographic processing for forming a dye image depending upon the purpose. Such processing techniques are illustrated for example in Research Disclosure, 17643, December 1978. Roller transport processing in an automatic processor is particularly preferred, as illustrated in US Pat. Nos. 3,025,779, 3,515,556, 3,545,971 and 3,647,459 and in UK Pat. No. 1,269,268. Hardening development can be undertaken, as illustrated in US Pat. No. 3,232,761.

The present invention remarkably reduces fog formation, whith concurrent increase of photographic speed, by adding a mercury compound to a silver halide emulsion layer containing tabular silver halide grains. This invention, in particular, is effective for high temperature, accelerated processing with a roller transport automatic processor in a developing solution containing an aldehyde type hardener.

The invention can be better appreciated by reference to the following illustrative examples.

EXAMPLE 1

A tabular grain silver bromide emulsion (having an average grain diameter of 1.43 μm and an average diameter: thickness ratio of 8.0:1) was divided into three portions and each portion was optically sensitized to green light with a cyanine dye and chemically sensitized with sodium thiosulfate and gold thiocyanate complex at a different digestion time (emulsion A1 digested for 130', A2 digested for 140' and A3 digested for 150'). Each emulsion, containing a wetting agent and 5-methyl-7-hydroxytriazaindolizine stabilizer, was added with 3 g/mole silver of resorcinol and with a bis-vinylsulfonylethylether hardener. Each emulsion was coated on a side of a blue polyester film support at a silver coverage of 4 g/m^2. An inert gelatin protective supercoat containing 1.5 g/m^2 of gelatin and dimethylolurea and resorcinaldehyde hardeners was applied on each coating (films A1, A2 and A3).

Samples of a tabular emulsion prepared as above were digested at different times in the presence of 0.79 x 10^{-3} mmole/mole of silver of $HgCl_2$ (emulsion B1 digested for 135', B2 digested for 145' and B3 digested 155'). Each emulsion, containing the same additions of emulsions above, was coated as above (films B1, B2 and B3).

Samples of a tabular emulsion prepared as above were digested at different times in the presence of 1.19 x 10^{-2} mmole/mole of silver of $HgCl_2$ (emulsion C1 digested for 135', C2 digested for 145' and C3 digested 155'). Each emulsion, containing the same additions of emulsions above, was coated as above (films C1, C2 and C3).

Samples of each film were incubated for different times and temperatures: 15 hours at 50 °C and 15 hours at 70 °C. Incubated samples of each film and samples not incubated of each film were exposed for 0.1 seconds to white light through band green and blue filters or to X-ray with a 3M Trimax™ T8 screen, or to red light through a Wratten™W1A filter and processed in a 3M Trimatic™ XP 515 roller transport processor. Processing consisted of 3M XAD/2 Developer for 27 seconds at 35 °C, followed by fixing in 3M AF/2 Fixer for 27 seconds at 30 °C, washing with tap water for 22 seconds at 35 °C and drying for 22 seconds at 35 °C.

The sensitometric results are tabulated in the following Table 1.

Table 1

Film	After 60 days shelf ageing				
	Dmin	Speed1	Speed2	Speed3	Av. Contrast	Speed4
A1	0.20	1.88	2.31	2.46	2.40	0.23
A2	0.20	1.92	2.36	2.52	2.50	0.24
A3	0.21	1.95	2.38	2.56	2.59	0.25
B1	0.19	1.95	2.38	2.55	2.58	0.23
B2	0.19	1.97	2.40	2.57	2.57	0.24
B3	0.20	2.00	2.42	2.60	2.56	0.24
C1	0.19	1.93	2.37	2.53	2.58	0.22
C2	0.19	1.99	2.43	2.61	2.50	0.24
C3	0.20	2.00	2.44	2.63	2.50	0.25

Film	After 110 days shelf ageing				
	Dmin	Speed1	Speed2	Speed3	Av. Contrast	Speed4
A1	0.21	1.88	2.32	2.41	2.40	0.26
A2	0.22	1.93	2.37	2.45	2.60	0.27
A3	0.23	1.95	2.38	2.47	2.57	0.30
B1	0.19	1.93	2.38	2.46	2.66	0.23
B2	0.19	1.96	2.40	2.50	2.64	0.24
B3	0.20	2.00	2.43	2.52	2.64	0.25
C1	0.19	1.91	2.37	2.45	2.63	0.23
C2	0.19	1.97	2.43	2.52	2.60	0.25
C3	0.20	2.01	2.45	2.53	2.55	0.26

Film	After 15 hours at 50°C				
	Dmin	Speed1	Speed2	Speed3 Av. Contrast	Speed4
A1	0.19	1.96	2.40	2.48 2.46	0.22
A2	0.19	1.99	2.44	2.55 2.50	0.22
A3	0.20	2.02	2.45	2.57 2.52	0.24
B1	0.18	2.00	2.44	2.56 2.55	0.21
B2	0.18	2.02	2.47	2.58 2.53	0.22
B3	0.19	2.05	2.49	2.62 2.53	0.24
C1	0.18	2.00	2.43	2.56 2.51	0.21
C2	0.19	2.06	2.49	2.63 2.45	0.24
C3	0.19	2.07	2.51	2.65 2.46	0.25

Film	After 15 hours at 70°C				
	Dmin	Speed1	Speed2	Speed3 Av. Contrast	Speed4
A1	0.22	1.97	2.39	2.52 2.12	0.31
A2	0.22	2.03	2.47	2.58 2.17	0.35
A3	0.23	2.05	2.47	2.60 2.28	0.37
B1	0.19	2.03	2.47	2.58 2.39	0.24
B2	0.19	2.05	2.47	2.60 2.37	0.27
B3	0.20	2.06	2.50	2.63 2.35	0.28
C1	0.19	2.03	2.47	2.59 2.33	0.23
C2	0.19	2.09	2.53	2.66 2.27	0.30
C3	0.20	2.09	2.53	2.69 2.20	0.34

(Speed1 is the relative sensitivity for the blue light exposure measured at 0.25 above Dmin. Speed2 is the relative sensitivity for the green light exposure measured at 0.25 above Dmin. Speed 3 is the relative sensitivity for X-ray exposure measured at 0.25 above Dmin. Speed 4 is the relative sensitivity for red light exposure. Speed values are expressed in log E (wherein E is the exposure expressed in meter-candle-seconds). Av. Contrast is the average contrast determined by measuring the slope of the characteristic curve between two points located at densities of 0.10 and 2.50 above Dmin).

From Table 1 it can be seen that the amount of mercuric chloride increases the photographic speed and still decreases the fog level of the silver halide emulsion containing tabular silver halide grains.

EXAMPLE 2

The tabular grain silver bromide emulsion of example 1 was optically sensitized to green light with a cyanine dye and chemically sensitized with sodium thiosulfate and gold thiocyanate complex at a digestion time of 135'. The emulsion, containing a wetting agent and 5-methyl-7-hydroxytriazaindolizine stabilizer, was added with 3 g/mole of silver of resorcinol and with a bis-vinylsulfonylethylether hardener. The emulsion was coated on a side of a blue polyester film support at a silver coverage of 4 g/m^2. An inert gelatin protective supercoat containing 1.5 g/m^2 of gelatin and dimethylolurea and resorcinaldehyde hardeners was

applied on the coating (film A).

A sample of a tabular silver halide emulsion prepared as above was digested for 135' in the presence of 0.79 x 10^{-3}mmole/mole of silver of $HgCl_2$. The emulsion, containing the same additions as above, was coated as above (film B).

A sample of a tabular silver halide emulsion prepared as above was digested for 145' in the presence of 1.19 x 10^{-2}mmole/mole of silver of $HgCl_2$. The emulsion, containing the same additions as above, was coated as above (film C).

Samples of each film were incubated for different times and temperatures: 15 hours at 50° C and 15 hours at 70° C. Incubated samples of each film and not incubated samples of each film were exposed and processed as described in example 1.

The sensitometric results are tabulated in the following Table 2.

Table 2

Film	After 30 days shelf ageing				
	Dmin	Speed1	Speed2	Speed3	Av. Contrast	Speed4
A	0.23	1.91	2.32	2.31	2.50	0.23
B	0.21	1.94	2.34	2.35	2.52	0.23
C	0.21	1.94	2.34	2.36	2.54	0.23
Film	**After 75 days shelf ageing**				
	Dmin	Speed1	Speed2	Speed3	Av. Contrast	Speed4
A	0.23	1.94	2.34	2.44	2.41	0.24
B	0.21	1.97	2.38	2.49	2.40	0.23
C	0.21	1.97	2.38	2.49	2.40	0.23
Film	**After 15 hours at 50°C**				
	Dmin	Speed1	Speed2	Speed3	Av. Contrast	Speed4
A	0.22	2.00	2.41	2.48	2.36	0.22
B	0.21	2.02	2.42	2.52	2.38	0.22
C	0.21	2.02	2.42	2.52	2.37	0.22
Film	**After 5 days at 50°C**				
	Dmin	Speed1	Speed2	Speed3	Av. Contrast	Speed4
A	0.27	2.01	2.42	2.50	2.07	0.33
B	0.21	2.04	2.45	2.55	2.24	0.25
C	0.21	2.06	2.47	2.56	2.22	0.26

Claims

1. A light-sensitive silver halide photographic material comprising a support and silver halide emulsion layer or layers, wherein at least one of said silver halide emulsion layers contains tabular silver halide grains having an average diameter:thickness ratio of at least 3:1 and a speed increasing amount of a mercury compound.

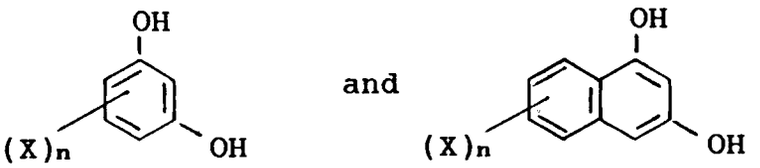
2. The light-sensitive silver halide photographic material of claim 1, wherein the mercury compound is a

mercuric or mercurous halide.

3. The light-sensitive silver halide photographic material of claim 1, wherein the mercury compound is present in an amount of from 0.0001 mmole to 0.01 mmole/mole of silver.

4. The light-sensitive silver halide photographic material of claim 1, wherein the mercury compound is combined with a fog inhibiting amount of a m-dihydroxybenzene compound.

5. The light-sensitive silver halide photographic material of claim 4, wherein said m-dihydroxybenzene compound has a formula selected from the group consisting of



wherein X is selected from the group consisting of a sulfo radical having the formula $-SO_3H$, a water-soluble salt of said sulfo radical, a carboxy radical having the formula -COOH, a water-soluble salt of said carboxy radical and a hydrogen atom, and n represents 1 or 2.

6. The light-sensitive silver halide photographic material of claim 4, wherein said m-dihydroxybenzene compound is present in an amount of about 1 to about 300 mmole per mole of silver halide in the silver halide emulsion layer containing said tabular silver halide grains.

7. The light-sensitive silver halide photographic material of claim 1, wherein said tabular silver halide grains have an average diameter:thickness ratio of 5:1 to 30:1.

8. The light-sensitive silver halide photographic material of claim 1, wherein said tabular silver halide grains have an average diameter ranging from about 0.3 to 5 micrometers.

9. The light-sensitive silver halide photographic material of claim 1, wherein said tabular silver halide grains have an average thickness of 0.4 micrometers or less.

10. The light-sensitive silver halide photographic material of claim 1, wherein not less than 40% of the silver halide grains are tabular silver halide grains having an average diameter:thickness ratio of at least 3:1.

11. A light-sensitive silver halide material for use in radiography with intensifying screens comprising a transparent support having coated on both sides silver halide emulsion layers, wherein at least one of said silver halide emulsion layers contains tabular silver halide grains having an average diameter:thickness ratio of at least 3:1 and an effective speed increasing amount of a mercury compound.

12. A light-sensitive silver halide photographic material comprising a support and silver halide emulsion layer or layers free of a latent image, wherein at least one of said silver halide emulsion layers contains tabular silver halide grains having an average diameter:thickness ratio of at least 3:1 and an effective speed increasing amount of a mercury compound.

13. The use of a mercury compound for increasing the photographic speed in a light-sensitive silver halide photographic material comprising a support and at least one silver halide emulsion layer containing tabular silver halide grains.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 11 0404

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	EP-A-0 352 618 (EASTMAN KODAK COMPANY) * page 8, line 25 - line 30; claims 1-15 * *	1-13	G 03 C 1/09 G 03 C 1/34 G 03 C 5/17
D	EP-A-0 352 618 (& US-A-4 885 233)		
Y	PATENT ABSTRACTS OF JAPAN vol. 13, no. 291 (P-893)(3639) 6 July 1989 & JP-A-1 072 141 (FUJI PHOTO FILM COMPANY LTD.) 17 March 1989 * abstract * *	1-13	
P,X	EP-A-0 425 884 (MINNESOTA MINING AND MANUFACTURING COMPANY)	1-13	
Y	US-A-4 425 426 (ABBOTT ET AL.) * column 25, line 44 - line 51; claims 1-15 * *	1-13	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

G 03 C

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	08 November 91	BUSCHA A.J.

CATEGORY OF CITED DOCUMENTS

- X : particularly relevant if taken alone
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