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(54) **Color photographic element which provides improved magenta image stability.**

(57) A silver halide color photograph reflection print element comprises a reflective support ad at least one dye-forming layer containing a mixture at a pH of up to about 5 of a silver halide emulsion, a magenta coupler, and an epoxide compound.

In a preferred embodiment, the reflective support is a resin-coated paper that has been rendered substantially impermeable to oxygen.

In a more preferred embodiment, the reflective support contains paper that is impregnated with polyvinyl alcohol.

EP 0 570 975 A1

FIELD OF THE INVENTION

This invention relates to a silver halide photographic element and, more particularly to a color photographic reflection print element that provides improved magenta dye image stability.

BACKGROUND OF THE INVENTION

Dyes used in color photographic materials are susceptible to degradation caused by a variety of environmental factors. For example, dyes can be faded by exposure to light of various wavelengths and intensities. In some instances, the fading of dyes by light is exacerbated by the presence of oxygen. Heat and moisture can also have a deleterious effect on the stability of photographic dyes.

A variety of methods have been proposed to restrict the access of such agents as oxygen and water to photographic images. For example, extruded polyolefin layers to increase the moisture resistance of papers used for photographic prints have been disclosed in U.S. Patent Nos. 3,411,908; 3,630,740; 4,042,398; 4,517,285; and 4,665,014. Resin-coated paper, which consists of a cellulosic fiber paper coated on both sides with polyethylene, is currently the most commonly used support for color photographic reflection prints.

U.S. Patent No. 4,645,736 discloses a waterproof paper support containing a layer of radiation hardened varnish, and with a polymeric barrier layer such as a polyolefin positioned between the varnish layer and the paper. A waterproof support in which a layer of hardenable acrylic resin is applied between the paper and a polyolefin layer is disclosed in U.S. Patent No. 4,729,945.

Although resin-coated papers are very impervious to moisture, their oxygen barrier properties are relatively poor, so that dye images on these supports are susceptible to light fading that is promoted by oxygen. U.S. Patent No. 4,283,486 discloses an oxygen impermeable or oxygen barrier layer comprising a vinyl alcohol polymer or copolymer positioned between a paper support and a color image-forming layer. A cover sheet or protective layer to restrict oxygen located above the light-sensitive layer is disclosed in U.S. Patent No. 4,945,025.

U.S. Patent No. 4,614,681 discloses a polyester film support in which an oxygen barrier layer comprising a copolymer of ethylene and vinyl alcohol is coated on the back side or on both sides of the support. A paper support having an ethylene-vinyl alcohol copolymer oxygen barrier layer on the side on which the image-forming layer is located is disclosed in JP 56/87038.

A paper support of low air permeability having a coating of a hydrophobic polymer on one or both sides of the paper is disclosed in U.S. Patent No. 4,861,696, which further suggests that a waterproofing agent can be added to the hydrophobic polymer layer.

EP Application No. 391373 discloses a photographic paper support impregnated through the surface with a low level of a synthetic polymer such as a polyacrylamide or a polyvinyl alcohol as a paper strengthening agent.

In addition to the fading of dyes by exposure to light, heat, and moisture, a photographic image is susceptible to further degradation resulting from discoloration of white areas, that is, areas of the image where dyes are not present. Discoloration of white areas, like the fading of image dyes, is promoted by exposure to light, both ultraviolet and visible, along with heat and moisture, as well as combinations of these environmental parameters.

The previously mentioned U.S. Patent No. 4,283,486 reports a reduction of light- and heat-induced discoloration of images produced on a paper support that has a polyvinyl alcohol-containing oxygen barrier layer between the paper and the dye-forming layers. Ultraviolet light (UV) absorbing compounds, especially substituted benzotriazoles, are effective in reducing the discoloration of image white areas caused by exposure to ultraviolet radiation.

The decomposition of magenta couplers by the action of light, heat, and moisture is a major cause of white area staining. U.S. Patent No. 4,540,657 and JP 62/131259 disclose the use of epoxide compounds as solvents for magenta couplers to reduce light-, heat-, and moisture-induced yellow stain.

EP Application No. 304067 discloses the use of epoxide solvents for yellow couplers with N-heterocyclic coupling- off groups and reports improvement in the light and dark heat storability of yellow images.

PROBLEM TO BE SOLVED BY THE INVENTION

It is especially desirable to improve the stability of full color photographic prints, composed of yellow, magenta, and cyan dyes, which are usually produced on paper supports and are frequently displayed.

Extending the useful life of a color photographic print requires that the dyes be protected against fading by light and other environmental factors, that any fade which does occur be neutral, that is, the decrease in density be approximately the same for each dye, and that staining of white areas be prevented.

SUMMARY OF THE INVENTION

In accordance with the present invention, a silver halide color photographic reflection print element comprises a reflective support and at least one dye-forming layer containing a mixture at a pH of up to about 5 of a silver halide emulsion, a magenta coupler, and an epoxide compound.

In one embodiment of the invention, the reflective support is a paper support impregnated or coated with an oxygen barrier material. A preferred oxygen barrier material is polyvinyl alcohol.

In another embodiment of the invention, a layer containing a homopolymer or copolymer of polyvinyl alcohol is interposed between the reflective support and the dye-forming layer.

In a further embodiment, an ultraviolet light (UV) absorber in an amount of at least 1 mmol/m^2 is coated above the magenta dye-forming layer.

ADVANTAGEOUS EFFECT OF THE INVENTION

The silver halide color photographic reflection print element of the present invention produces a magenta dye image with significantly improved resistance to fading by light and a marked diminution of heat- and moisture-induced staining of white areas. Furthermore, a full color photographic image that is produced by an element of the present invention and contains yellow, magenta, and cyan dyes exhibits, after exposure to light, similar reductions in the densities of its yellow and magenta components in particular. The resulting neutral fade maintains the pleasing appearance of the color photograph and prolongs its useful life.

In a full color photograph, the fading of the cyan image is caused primarily by the action of light. The degradation of the yellow and magenta images, on the other hand, is the result of the combined effects of exposure to light and oxygen. Therefore, limiting the access of oxygen in the photographic element contributes to the improvement of yellow and magenta dye stability.

DETAILED DESCRIPTION OF THE INVENTION

In accordance with the present invention, the reflective support can be a resin-coated paper, or a microvoided oriented polymeric sheet or film disclosed in copending, commonly assigned application, U.S. Serial No. 516,998, filed April 30, 1990, entitled "Photographic Elements Containing Reflective or Diffusely Transmissive Supports," incorporated herein by reference, or a resin-coated microvoided oriented polymeric sheet or film disclosed in co-pending, commonly assigned application, U.S. Serial No 887,710, filed May 22, 1992, entitled "Color Photographic Element with Support Which Provides Improved Dye Stability," incorporated herein by reference.

In a preferred embodiment, the reflective support is a resin-coated paper that has very low permeability to oxygen. This diminished oxygen-permeability can be attained by inclusion in the support of an oxygen barrier layer containing a homopolymer or copolymer of vinyl alcohol, as disclosed in the previously mentioned U.S. Patent No. 4,283,486, incorporated herein by reference.

In a more preferred embodiment, the reflective support contains paper that is impregnated with a substance that lowers its oxygen permeability. A preferred oxygen permeability-lowering substance is polyvinyl alcohol, as disclosed in copending, commonly assigned application, U.S. Serial No. 756,262, filed August 19, 1991, entitled "Photographic Paper with Low Oxygen Permeability," incorporated herein by reference.

In accordance with the present invention, the sheet of paper support can be of any desired basis weight. It is generally preferred that the sheet have a basis weight of between about 122 g/m^2 (25 lb/1000 ft^2) and about 244 g/m^2 (50 lb/1000 ft^2) to provide a conventional feel and handling to the impregnated paper. A heavier weight paper of up to 391 g/m^2 (80 lb/1000 ft^2) may be preferred for display purposes.

The paper support is impregnated with polyvinyl alcohol, using the procedure described in the previously mentioned application, U.S. Serial No. 756,262, entitled "Photographic Paper with Low Oxygen Permeability." The polyvinyl alcohol utilized can be any polyvinyl alcohol that renders the paper substantially impermeable to oxygen. Polyvinyl alcohol is formed by hydrolysis of vinyl acetate. Polyvinyl alcohol prior to use is soluble in water and available in powder or pellet form. The more fully hydrolyzed polyvinyl alcohols have higher water and humidity resistance. The weight-average molecular weight may vary between above 13,000 and up to 200,000. The higher molecular weight materials have increased water resistance, adhesive strength, and viscosity. A preferred material has been found to be a medium molecular weight polyvinyl alcohol of about 99 percent hydrolysis, as this material provides reduced oxygen permeability of the paper.

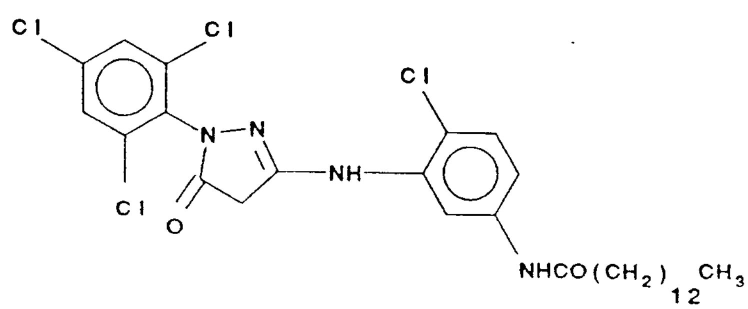
The polyvinyl alcohol polymer is impregnated in any amount that provides substantial oxygen impermeability. Generally it is preferred that the pick-up range be between about 3 and about 12 weight percent of the dry paper weight for an effective barrier to oxygen infiltration and relatively low cost. A pick-up of about 4 to about 9 weight percent is preferred for good oxygen permeability properties at low cost. Impregnation results in a paper that does not have a polyvinyl alcohol layer above the surface but has polyvinyl alcohol concentrated near both surfaces of the paper. It has been found that two applications or passes of the paper in polyvinyl alcohol solution with drying after each pass results in sufficient pick-up of polyvinyl alcohol to provide the oxygen impermeability desired.

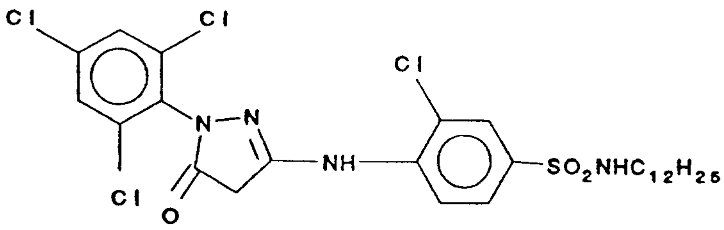
The polyolefin-containing layer is applied to the polyvinyl alcohol-impregnated paper by extrusion from a hot melt as is known from the art, for example, U.S. Patent No. 3,411,908, incorporated herein by reference. In a preferred embodiment of the present invention, the polyolefin is polyethylene and is applied to both sides of the paper support, and the polyethylene layer on the front side also contains 12.5 weight percent anatase TiO_2, 3.0 weight percent ZnO, 0.5 weight percent calcium stearate, and small amounts of antioxidant, colorants and optical brightener. The total amount of coated polyethylene is from about 50 g/m^2 to about 200 g/m^2, preferably at least about 70 g/m^2.

The polyvinyl alcohol-impregnated and polyethylene-coated paper support can be utilized in the formation of a photographic element of the invention which, after exposing and processing, generates a colored image that is surprisingly stable to light. Furthermore, the image exhibits more nearly neutral fade to light; the image dyes fade at approximately the same rate, thus prolonging the useful lifetime of the print. In a typical color print, the light stabilities of the yellow and magenta image dyes are usually inferior to the light stability of the cyan image dye, leading to an objectionable non-neutral fade of the color print. For color prints produced in accordance with the present invention, however, the light stabilities of the yellow and magenta image dyes are improved substantially, while the light stability of the cyan image dye remains largely unaffected, leading to greater image stability and neutral color fade.

Magenta image dyes are formed by the reaction of oxidized color developing agents with 2- and 4-equivalent image couplers such as open-chain ketomethylene compounds, pyrazolones, pyrazolotriazoles, pyrazolobenzimidazoles, and indazolones. Typically, such image couplers are ballasted for incorporation in high boiling coupler solvents. Couplers which form magenta dyes upon reaction with oxidized color developing agents are described in such representative patents and publications as: U.S. Patent Nos. 2,600,788; 2,369,489; 2,343,703; 2,311,082; 2,908,573; 3,152,896; 3,519,429; 3,062,653; and T.H. James, editor, The Theory of the Photographic Process, 4th Edition, MacMillan, New York, 1977, pp 356-358, all incorporated herein by reference.

Useful magenta couplers for the practice of the present invention include the following:

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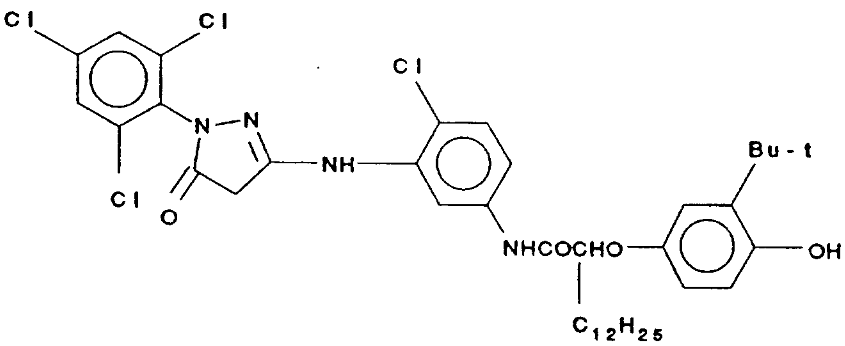
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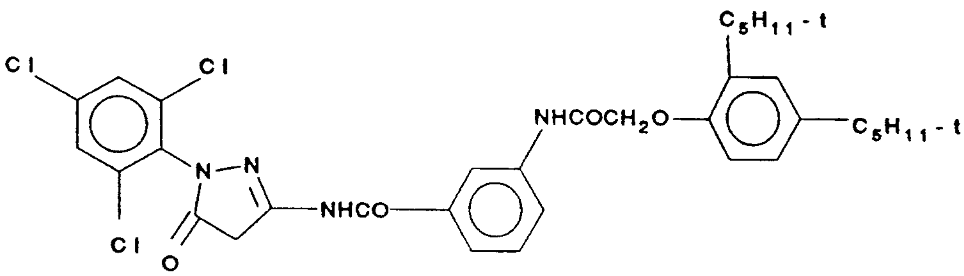
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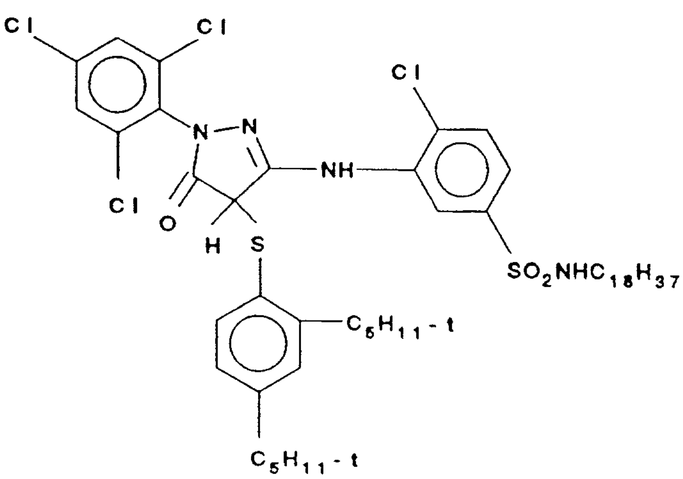
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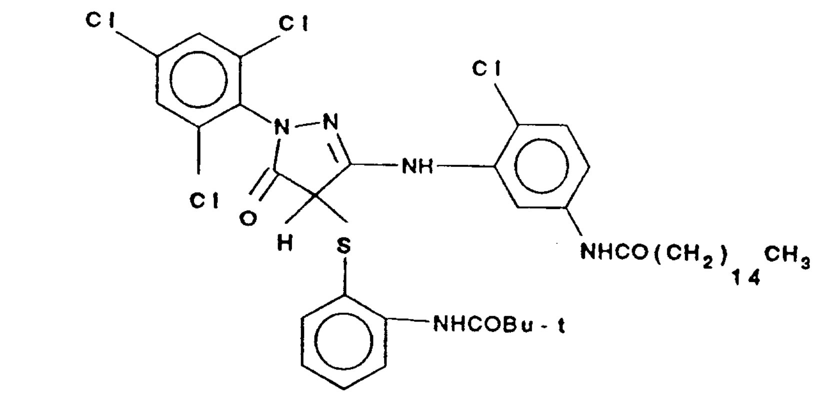
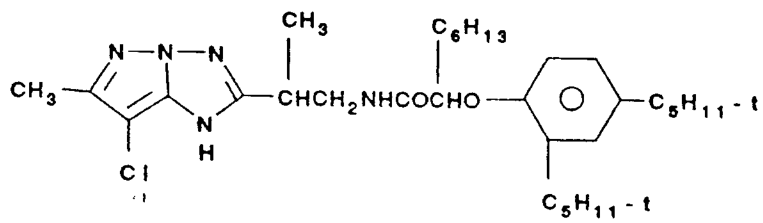
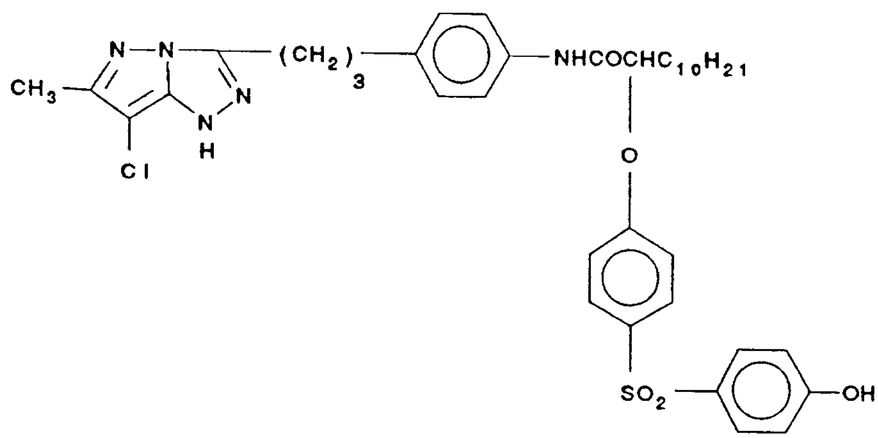






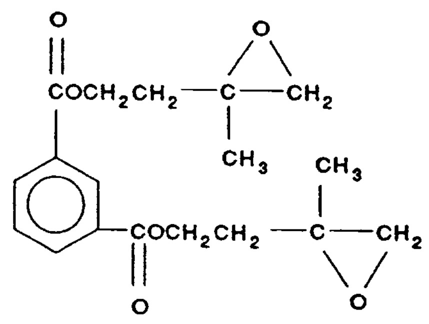
Preferred magenta couplers are 5-pyrazolone compounds. Especially preferred are 1-aryl-3-arylamino-5-pyrazolone compounds.

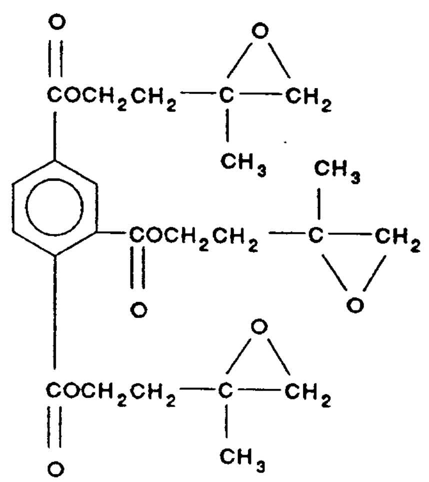
As disclosed in the previously mentioned U.S. Patent No. 4,540,657, epoxide compounds containing at least one terminal epoxy group and at least one ester or amide group are useful solvents for magenta couplers in color photographic elements. A color reflection print produced from an element containing a dispersion of a magenta coupler in an epoxide solvent has reduced background stain or discoloration of white areas, which is generated by light, heat, moisture, and combinations thereof.

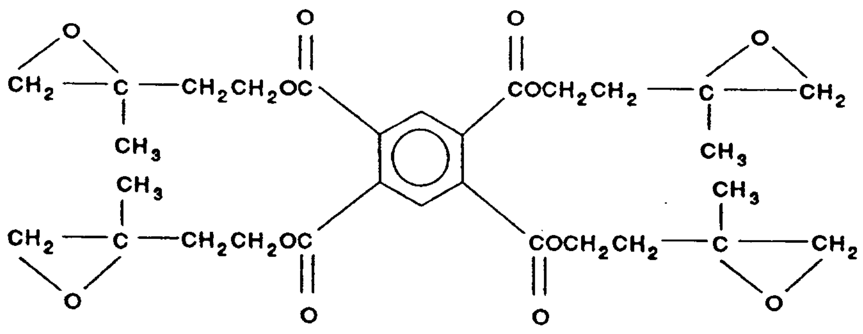
The pH of gelatin dispersions of silver halide are typically about 5.6. When a photographic element having a silver halide emulsion that contains a dispersion of a magenta coupler in an epoxide solvent is prepared under these conditions and then kept at elevated temperature and humidity, the magenta coupler is deactivated by interaction with the epoxide solvent, resulting in lowered magenta dye maximum densities upon subsequent photographic processing.

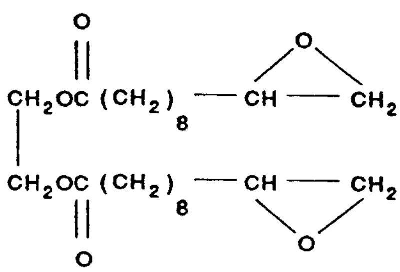
It has now been unexpectedly found that, if the layer containing the silver halide emulsion, magenta coupler, and epoxide compound is coated at a pH of up to about 5, preferably between about 4.5 and about 5, the activity of the magenta coupler is not degraded during keeping, and a high magenta dye maximum density is obtained upon color photographic processing.

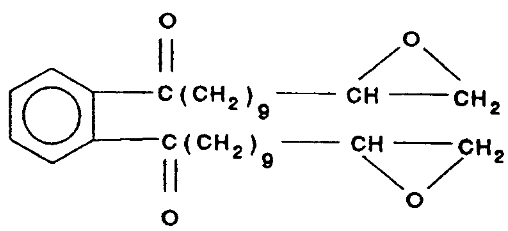
Epoxide compounds useful as solvents for magenta couplers in photographic elements of the present invention include the following:

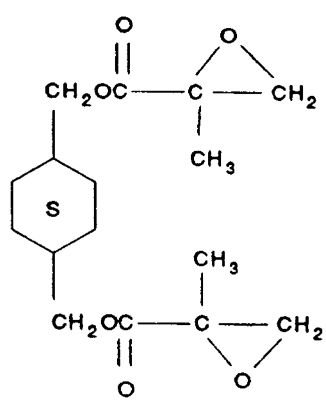


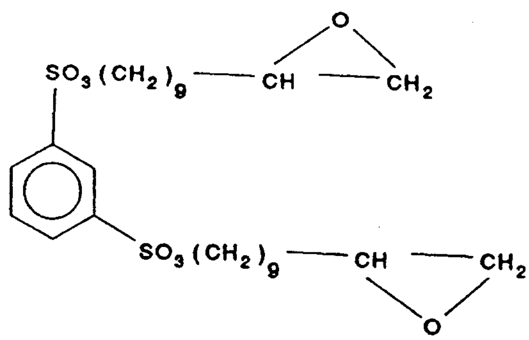


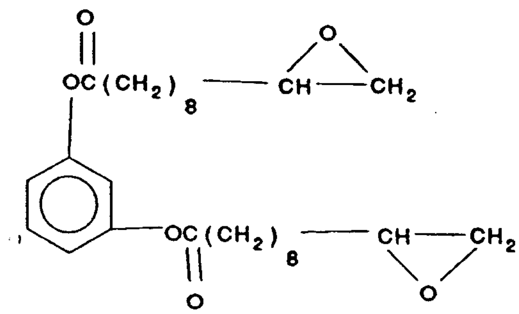


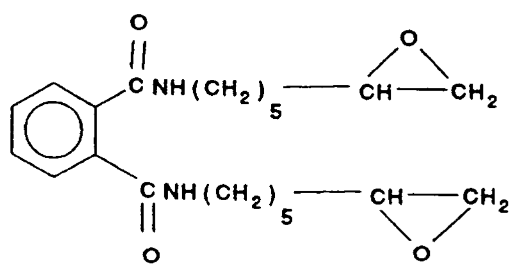


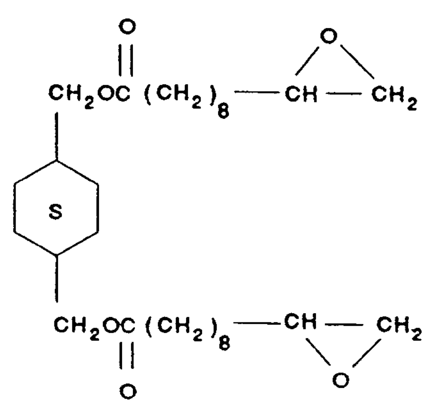


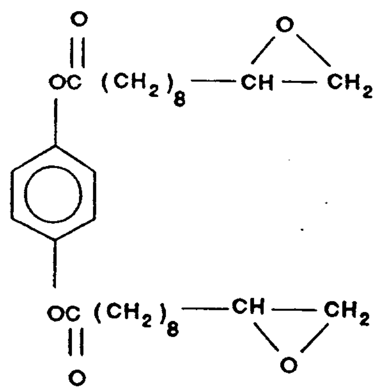












Other epoxide compounds suitable as solvents for magenta couplers are disclosed in the previously mentioned U.S. Patent No. 4,540,657, incorporated herein by reference.

Couplers which form yellow dyes upon reaction with oxidized color developing agents are described in such representative patents and publications as: U.S. Patent Nos. 2,298,443; 2,875,057; 2,407,210; 3,048,194; 3,265,506; 3,447,928; 5,021,333, and The Theory of the Photographic Process, pp 354-356, all incorporated herein by reference.

In addition, other image couplers which can be used are described in the patents listed in Research Disclosure, December 1989, Item No. 308119, Section VIID, the disclosure of which is incorporated herein by reference.

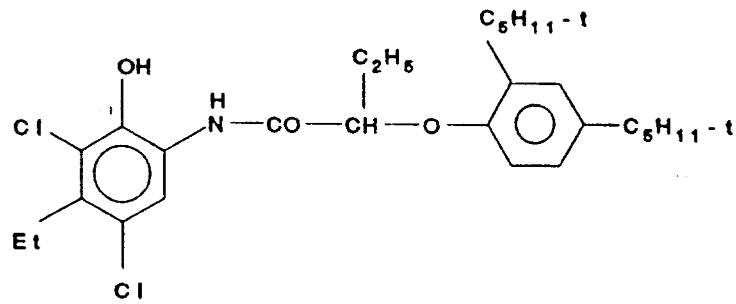
Another key element to enhancing the useful lifetime of a color print is the reduction or elimination of the yellow stain which can form on prolonged exposure to light. This can be accomplished by coating an ultraviolet light (UV) absorber in the photographic element. Typically the UV absorbers are substituted phenylbenzotriazoles, which are described in such representative patents as U.S. Patent Nos. 4,383,863; 4,447,511; 4,790,959; 4,752,298; 4,853,471; 4,973,701, incorporated herein by reference. Ultraviolet light absorbers which are liquids are preferred in order to minimize crystallization and surface blooming problems observed with solid absorbers.

The UV absorber can be coated in gelatin or other protective colloid in one or more layers above the magenta dye-forming layer. The amount of included UV absorber is preferably at least 1 mmol/m^2, more preferably at least 1.5 mmol/m^2, and most preferably from about 2.5 to about 4.5 mmol/m^2.

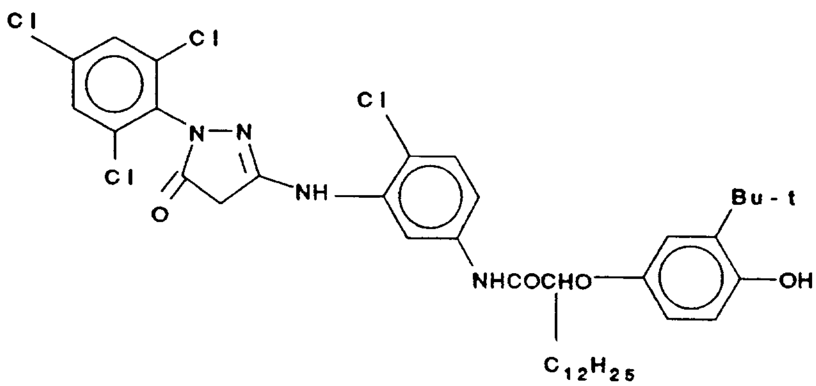
Various layers to convert the paper support into a light reflecting print material, such as silver halide emulsion layers, subbing layers, interlayers, and overcoat layers are provided in the photographic element of the invention. The silver halide emulsion employed in the elements of this invention can be either negative-working or positive-working. Suitable emulsions and their preparation are described in sections I and II of Research Disclosure, December 1989, Item No. 308119, sections I and II, the disclosure of which is incorporated herein by reference. The silver halide emulsions employed in the present invention preferably comprise silver chloride grains which are at least 80 mole percent silver chloride and the remainder silver bromide.

The following examples further illustrate the invention. Given below are the structures of the cyan, magenta, and yellow couplers (couplers C, M, Y, respectively), ultraviolet light (UV) absorbers U, V, and W, stabilizer S, and epoxide compound E used in the examples.

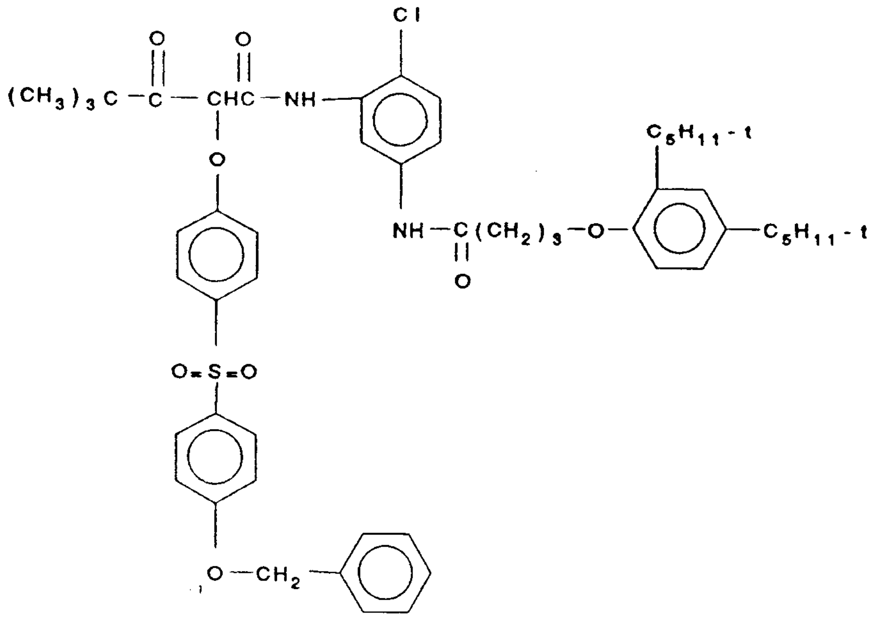
Coupler C



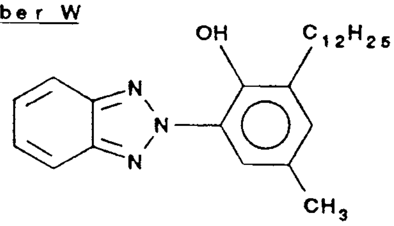
Coupler M



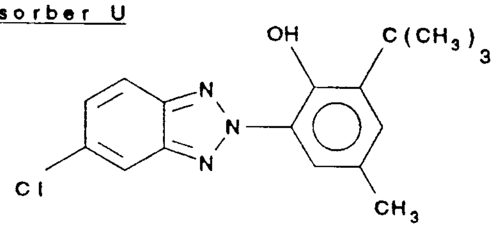
Coupler Y



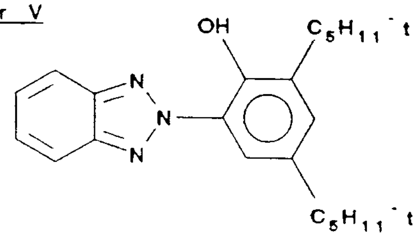
UV Absorber W



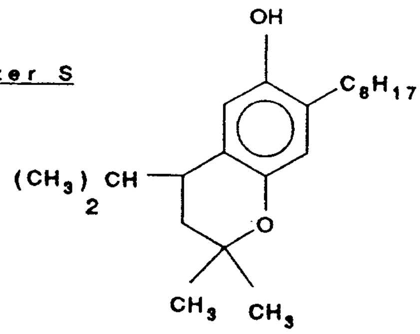
UV Absorber U



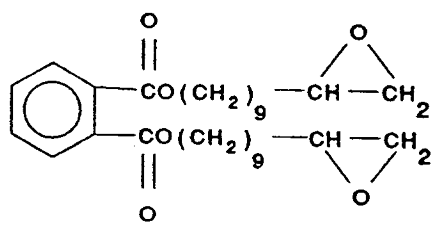
UV Absorber V



Stabilizer S



Epoxide Compound E



Example 1

Effect of silver halide emulsion pH on magenta dye maximum density

A series of magenta dye-forming color photographic elements having the component layers shown in Table 1 below was coated on a resin-coated paper support. The pH of the silver halide emulsion melt containing the magenta coupler dispersion and the gelatin melts for the protective and UV absorber layers was varied from 4.5 to 6.5, using 6N nitric acid. A similar series of coatings with varying melt pH was prepared in which the dibutyl phthalate in the dye-forming layer was replaced at equal weight coverage by the epoxide compound E.

TABLE 1

Layer No.	Layer	Material	Coverage mg/m^2
3	Protective	Gelatin Hardener	1399 131
2	UV absorber	Gelatin UV absorber U UV absorber V	1076 129 732
1	Dye-forming	Gelatin Silver halide Coupler M Stabilizer S Dibutyl phthalate	1614 280 430 368 215

Samples of each of the series of coatings was incubated in an oven maintained at 49°C and 50% RH for 3 weeks. Duplicate samples were maintained at 0 °C for the same period of time. All the samples were simultaneously exposed and processed, using the Kodak Ektacolor RA-4 color development process.

Maximum densities of magenta dye (green Dmax) were measured for each of the exposed and processed samples, and the differences between the corresponding incubated and non-incubated samples were calculated. Table 2 below compiles the results of these measurements and calculations.

TABLE 2

Element	Melt Coating pH	Magenta Coupler Solvent	Change in Green Dmax After Incubation
1	4.5	dibutyl phthalate	-0.04
2	5.0	dibutyl phthalate	0.00
3	5.5	dibutyl phthalate	-0.04
4	6.0	dibutyl phthalate	-0.03
5	6.5	dibutyl phthalate	-0.06
6	4.5	epoxide compound E	-0.05
7	5.0	epoxide compound E	-0.10
8	5.5	epoxide compound E	-0.16
9	6.0	epoxide compound E	-0.32
10	6.5	epoxide compound E	-0.45

As shown by the data of Table 2, measured green Dmax values from those elements (1,2,3,4,5) containing dibutyl phthalate in the magenta dye-forming layer were little affected by incubation over the melt coating pH range of 4.5 to 6.5. However those elements (6,7,8,9,10) containing the epoxide compound E showed a lowering of green Dmax for the incubated samples, the magnitude of the loss increasing with higher melt coating pH values and being particularly severe as the melt pH was raised above 5.

Example 2

Effect of support, UV absorber coverage, and magenta coupler solvent on image dye stability

A series of color photographic elements having the component layers shown in Table 3 below was coated on a resin-coated paper support and on a resin-coated support that had been impregnated with 8 weight percent polyvinyl alcohol (based on the weight of the dry starting paper) according to the procedure described in the previously mentioned application, U.S. Serial No. 756,282, entitled "Photographic Paper with Low Oxygen Permeability." The silver halide emulsion melts containing the dye-forming coupler dispersions and the gelatin melts for the protective and UV absorber layers were all adjusted to pH 5.0 with 6N nitric acid.

TABLE 3

Layer No.	Layer	Material	Coverage mg/m²
7	Protective	Gelatin	1345
6	UV absorber	Gelatin UV absorber W	699 varying
5	Red-sensitive	Gelatin Red-sensitive silver halide* Coupler C Dibutyl phthalate	1076 253 423 212
4	UV absorber	Gelatin UV absorber W	699 varying
3	Green-sensitive	Gelatin Green-sensitive silver halide* Coupler M Stabilizer S Dibutyl phthalate <u>or</u> epoxide compound E	1237 283 423 92 211
2	Interlayer	Gelatin	753
1	Blue-sensitive	Gelatin Blue-sensitive silver halide* Coupler Y Dibutyl phthalate	1506 292 1076 269

*Silver halide emulsions are $AgBr_1Cl_{99}$

UV absorber W was included in both UV absorber layers in amounts varying from 753-1506 mg/m^2 (1.92-3.83 mmol/m^2). The magenta coupler solvent was varied between dibutyl phthalate and epoxide compound E.

Samples of the color photographic elements prepared as described were exposed and processed in a standard Kodak Ektacolor RA-4 process. The processed samples were subjected to two test conditions:

1. exposure to unfiltered 50 Klux light for 4 weeks, or
2. storage at 60 °C, 70% RH for 8 weeks.

Losses of cyan (red fade), magenta (green fade), and yellow (blue fade) dyes from a neutral image area and increases in yellow stain (printout ΔDmin) in a white area were measured after test condition 1, and increases in yellow stain (yellowing ΔDmin) in a white area resulting from the combined effects of heat and moisture were measured after test condition 2. The results of these measurements are compiled in Table 4.

TABLE 4

Element	Paper Support	UV Absorber W Coverage in each UV absorber layer mg/m^2 (mmol/m^2)	Magenta Coupler Solvent	Dye Fade from neutral image 50 Klux for 4 weeks		Printout ΔDmin 50 Klux for 4 weeks	Yellowing ΔDmin 60°C, 70% RH 8 weeks
1	Resin-coated	753 (1.92)	Dibutyl phthalate	Red Green Blue	-0.27 -0.28 -0.13	0.22	0.15
2	Resin-coated	1506 (3.83)	Dibutyl phthalate	Red Green Blue	-0.27 -0.28 -0.13	0.06	0.14
3	Polyvinyl alcohol-impregnated resin-coated	861 (2.19)	Dibutyl phthalate	Red Green Blue	-0.24 -0.17 -0.13	0.18	0.15
4	Polyvinyl alcohol-impregnated resin-coated	1442 (3.67)	Dibutyl phthalate	Red Green Blue	-0.14 -0.16 -0.15	0.03	0.15
5	Polyvinyl alcohol-impregnated resin-coated	1442 (3.67)	Epoxide compound E	Red Green Blue	-0.14 -0.16 -0.15	0.04	0.08

Element 1, which contained the magenta coupler dispersed in dibutyl phthalate, 753 mg/m^2 (1.92 mmol/m^2) of UV absorber in each UV absorber layer, and a resin-coated paper support, showed high light fade of the magenta dye in a neutral image area and also gave a large increase in yellow stain in white areas both after light exposure (test condition 1) and after storage at elevated temperature and humidity (test condition 2).

Element 2, which differed from element 1 in containing a higher coverage of UV absorber (1506 mg/m^2, 3.83 mmol/m^2) in each UV absorber layer, showed a large decrease in light-induced staining (printout WDmin) of white areas.

The coated component layers of element 3 were similar to those of element 1, but they were coated on a polyvinyl alcohol-impregnated paper support. The magenta dye light fade of element 3 in a neutral image area was considerably improved relative to that measured for element 1, but yellow stain produced by light, heat and moisture remained high.

Element 4, which differed from element 3 in containing a high coverage of UV absorber (1442 mg/m^2, 3.67 mmol/m^2) in each UV absorber layer, showed low and equal tight fade of all three dyes in a neutral image area ad low light-induced yellow stain in white areas, but the yellowing stain after storage at 60 °C, 70% RH remained high.

Element 5 was similar to element 4, except that the magenta coupler solvent was, in accordance with the present invention, an epoxide compound. The low, neutral light fade ad low printout measured for element 4 were maintained in clement 5, which, in addition, exhibited significantly reduced yellowing in the white areas. This demonstrates the advantage, in accordance with the present invention, of a photographic reflection print element containing an oxygen barrier material, a epoxide compound in the magenta dye-forming layer at a pH of up to about 5, and a amount of ultraviolet light absorber of at least 2 mmol/m^2, ad preferably more than 3 mmol/m^2, in each UV absorber layer.

Claims

1. A silver halide color photographic reflection print element comprising: a reflective support; and at least one dye-forming layer containing a mixture at a pH of up to about 5 of a silver halide emulsion, a magenta coupler, and an epoxide compound.

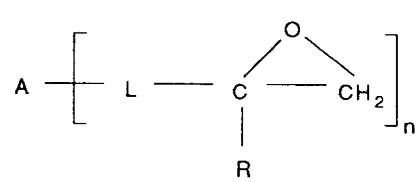
2. A photographic element of Claim 1 wherein said reflective support is a paper support impregnated or coated with an oxygen barrier material.

3. A photographic element of Claim 2 wherein said oxygen gas transmission rate-reducing substance is polyvinyl alcohol.

4. A photographic element of Claim 3 further comprising a second polyolefin-containing layer on said support on the side opposite to that which bears said dye-forming layer and a layer that contains an ultraviolet light absorber overlying said dye-forming layer.

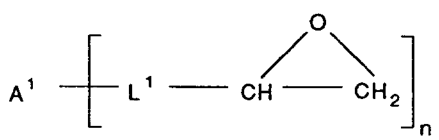
5. A photographic element of Claim 1 wherein said epoxide compound has at least one terminal epoxy group and at least one ester or amide group.

6. A photographic element of Claim 5, wherein said epoxide compound has the formula:



wherein A is a polyvalent atom, an acidic oxide group, a carbocyclic group, a heterocyclic moiety, or an alkyl or substituted alkyl group; each L is at least one divalent linking group; each R is H, alkyl, cycloalkyl, aryl, heterocyclyl, or COOR^1, wherein R^1 is alkyl of 1 to about 20 carbon atoms, or can be taken together with A or L to form a ring; and n is a positive integer of at least one, with the proviso that at least one A, L, or R contains at least one ester or amide group derived from an acidic oxide of carbon, phosphorus, sulfur, boron, or silicon.

7. A photographic element of Claim 6 wherein said epoxide compound has the formula:



wherein A^1 is an alkyl or substituted alkyl group or a carbocyclic group, L^1 is a carboxylic ester, and n is a positive integer of at least one.

8. A photographic element of Claim 7, wherein A^1 is a benzene ring, n is 2, and each L^1 is $-COO(CH_2)_9$.

9. A photographic element of Claim 1 wherein the weight ratio of said epoxide compound to said magenta coupler is from about 0.1:1 to about 2:1.

10. A photographic element of Claim 4 wherein said paper support contains from about 3 to about 12 weight percent polyvinyl alcohol.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 10 8277

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-0 331 004 (KODAK) * the whole document * ---	1-10	G03C7/388 G03C1/79 G03C1/005
Y	US-A-5 047 315 (MORIGAKI ET AL.) * column 46, line 38 - column 48, line 32 * * column 78, line 50 - column 79, line 30 * * column 89; table 4 * ---	1-10	
Y D	GB-A-2 059 614 (FUJI) * page 2, line 22 - line 55 * * page 27, line 23 - line 36 * * page 33, line 3 - line 10 * & US-A-4 283 486 ---	1-10	
Y	JP-A-62 253 154 (FUJI) * abstract * * page 2, right column, line 16 - line 17 * * page 8, right column, line 4 * ---	1-10	**TECHNICAL FIELDS SEARCHED (Int. Cl.5)**
A	PATENT ABSTRACTS OF JAPAN vol. 11, no. 350 (P-637)(2797) 17 November 1987 & JP-A-62 129 847 (KONISHIROKU) 12 June 1987 * abstract * -----	1-10	G03C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	15 JULY 1993	MAGRIZOS S.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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