

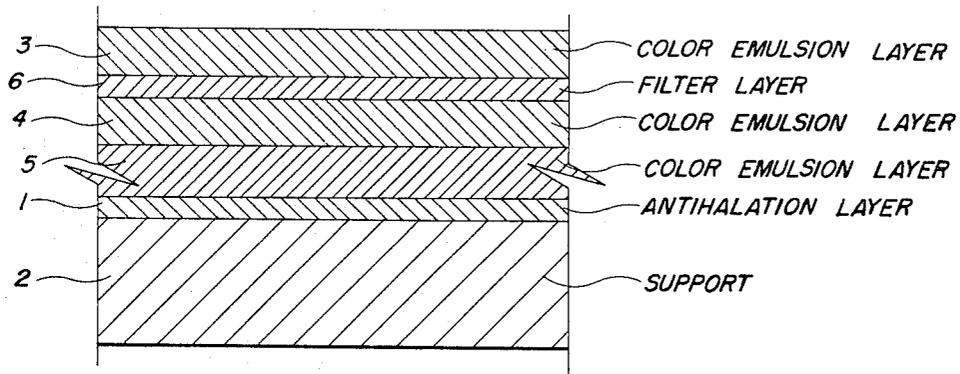
March 25, 1969

H. G. MCGUCKIN

3,434,839

PHOTOGRAPHIC ANTIHALATION LAYERS

Filed June 1, 1965



HUGH G. MCGUCKIN
INVENTOR

BY *R. Frank Smith*
Henry E. Byers
ATTORNEYS

1

2

3,434,839

PHOTOGRAPHIC ANTIHALATION LAYERS

Hugh G. McGuckin, Rochester, N.Y., assignor to Eastman Kodak Company, Rochester, N.Y., a corporation of New Jersey

Filed June 1, 1965, Ser. No. 460,244

Int. Cl. G03c 1/84, 7/20

U.S. Cl. 96-84

27 Claims

ABSTRACT OF THE DISCLOSURE

Toned Carey Lea silver and antihalation layers comprising toned Carey Lea silver are provided by reacting Carey Lea silver with sufficient thiol compound to tone the Carey Lea silver gray. The antihalation Carey Lea silver can be used in photographic elements particularly in multilayer photographic color films and can be conveniently removed in customary processing of the element.

This invention relates to photographic elements and more particularly relates to antihalation components of photographic elements.

It is desirable to have in photographic products some form of antihalation layer which absorbs light in order to avoid undesirable reflections from the film base or from interfaces between the emulsion layer or layers and the film base which if not avoided cause additional diffused exposure of the silver halide emulsion.

Among the more recent methods used for preventing halation is the use of dye-containing peloids, the so-called gray silver underlayer, and carbon black dispersed in a polymeric or colloidal binder. The use of gray silver suffers from requiring substantial amounts of silver to provide an acceptable density for use as an antihalation layer, and the use of carbon black dispersed in a binder is particularly disadvantageous because of the resulting contamination of the solutions used in processing the exposed photographic element.

Furthermore, when dye layers are used, the neutral density which is desired has usually required two or three dyes to obtain a neutral absorption of the light. This is particularly important in color processes requiring a neutral density layer such as that disclosed in Millikan's patent application Ser. No. 159,057, filed Dec. 13, 1961, and now abandoned.

In some of the antihalation methods used heretofore, an antihalation layer containing, for instance, pigments or dyes or carbon black is coated on the reverse side of the film base or support. Normal processing of the exposed film in an alkaline developer solution causes the antihalation layer to be dissolved away, thus contaminating the developer solution.

Silver antihalation layers are used because the silver is subject to bleaching in ferricyanide type bleach solutions which are conventionally used with silver halide emulsions intended for the formation of colored images. For instance, silver particles have been used in antihalation layers in what has been known as gray silver. These gray silver particles have a size of at least 0.1 micron. However, the gray silver coating has been relatively expensive due to the necessity for sufficient silver to provide adequate density and also due to the particle size of the silver used.

Carey Lea silver has been well known as a filter layer particularly for use in multilayer photographic products where it has served to filter out certain wavelengths. However, it has not been possible to satisfactorily tone Carey Lea silver to provide an antihalation layer, although it would be less expensive to use a silver having a much

smaller particle size and which has greater covering power than the gray silver. Moreover, the presence of Carey Lea silver in a layer contiguous to a silver halide emulsion has in some instances been detrimental since the Carey Lea silver acted as nuclei for the physical development of silver during the first processing step using a conventional black-and-white developer. In such an element, the Carey Lea silver particles would act as sites on which silver from a silver halide emulsion would be deposited, thereby reducing the density of the resulting silver image formed in the silver halide emulsion.

For these reasons, it was desirable to find some means not only of toning the Carey Lea silver, but also providing toned Carey Lea silver particles which would not act as physical development sites for the contiguous silver halide emulsion.

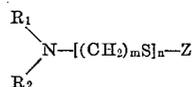
It has also been desirable to find a material with a neutral color which would act as antihalation material when used as an undercoat but which could be processed in normal photographic processing to a transparent film without contaminating the processing solutions. Such an antihalation material must be compatible with the light-sensitive element, such as a silver halide emulsion, and should not appreciably affect the speed of the emulsion when utilized as a contiguous layer.

I have now discovered that an advantageous antihalation material is Carey Lea silver toned neutral, which at the same time obviates the disadvantage of having Carey Lea silver as sites for physical development. In addition, the tone Carey Lea silver has greater covering power than gray silver with the advantage of lower cost.

One object of this invention is to provide an improved antihalation layer which can be rendered transparent in a conventional silver bleaching solution. Another object is to provide a method of toning Carey Lea silver so it can be used for an antihalation layer. A further object is to provide less expensive silver-containing antihalation layers. A still further object is to provide multilayer color elements containing an antihalation layer which can be rendered transparent in a conventional bleach solution. An additional object is to provide a Carey Lea silver antihalation layer which does not provide sites for physical development from a contiguous silver halide emulsion. Another object is to provide an antihalation material which is compatible with a light-sensitive emulsion and which does not have an appreciable effect on the speed of the silver halide emulsion when used as an antihalation undercoat. A further object is to provide an antihalation undercoat having a greater density and being made from readily available materials.

The discovery is unexpected in view of the prior art's teaching that the toning of a conventionally chemically developed silver image produces a color which is other than neutral such as a sepia tone which is entirely unsuitable for use in an antihalation layer. It is furthermore unexpected that Carey Lea silver could be toned a neutral black which would have a greater density for use as an antihalation material than the gray silver used heretofore.

In one embodiment, my invention comprises an antihalation composition for use with photographic elements comprising Carey Lea silver toned neutral with an amino alkylthiol oligomer or mixture thereof as illustrated by the following general formula:



wherein R_1 and R_2 represent hydrogen atoms or identical alkyl groups such as, for example, methyl, ethyl, or propyl, or identical hydroxyalkyl groups such as, for example, 2-hydroxyethyl, or 2-hydroxy-1-propyl, or, taken together,

represent a saturated ring of five or six atoms such as, for example, morpholinyl, or piperidyl, or, if R_1 represents hydrogen, or methyl, R_2 represents hydrogen or hydroxyalkyl groups such as, for example, 2-hydroxyethyl, 1,1-dimethyl-2-hydroxyethyl, 1,1-(dihydroxymethyl)-ethyl, tris-(hydroxymethyl)methyl, glucosyl, m represents a small integer between one and five, n represents an integer between one and four or a fraction between one and four, and Z represents a hydrogen atom or a moiety which is replaceable by a silver atom.

The oligomers useful in my invention are low molecular weight polymeric materials containing one or more alkylene sulfide chains. Commonly, these materials are prepared as mixtures of several chain lengths and it is convenient to represent the structure by showing n as an average value for the different chain lengths which may be present. In some cases, n will be a fraction such as, for example, 1.25.

Such oligomers include aminoalkanethiols, aminoalkyl-enthioalkanethiols, etc., and their derivatives in which the terminal hydrogen is replaced by organic groups such as hydroxymethyl, iminocarbamoyl and the like, or by a metal replaceable by silver, in aqueous solution, advantageously under alkaline conditions, for example, zinc or zirconium. It will be seen from the foregoing that the oligomers useful in my invention may be in the thiol form or those in which the hydrogen of the thiol group in the oligomer is replaced by a moiety from which the free thiol may be readily formed in aqueous solution. For example, in the case of isothiuronium salts which contain the iminocarbamoyl group in place of hydrogen, treatment with alkali will split off the cyanamide group and the thiol will be formed; specifically, from 3-dimethylaminopropylisothiuronium chloride hydrochloride, the 3-dimethylaminopropanethiol will be formed. In the case wherein the thiol derivative is a mercaptal wherein the thiol hydrogen is replaced by a hydroxyethyl group, the thio is readily generated. For example, 2-dimethylaminoethyl hydroxymethyl sulfide will yield 2-dimethylaminoethanethiol. In the case of salts formed with the thiol compound with metal ions, the particular metal replaceable by silver, for example, the cadmium salts of diethylaminoethanethiol may be used effectively. Metals of group IIb for example, zinc, and metals of group IVb such as zirconium are useful.

In a particularly useful embodiment, I use diethylaminoethanethiol to tone Carey Lea silver. For use as an antihalation agent, it is normal to dispose the toned Carey Lea silver in a binder of the kind conventionally used in preparing silver halide emulsions, such as proteinaceous colloids, including gelatin, casein or zein, and synthetic polymeric substances such as polyvinyl alcohol, polyacrylates, hydrolyzed cellulose esters or cellulose ethers. In the event that the antihalation layer is to be used on the back of a film support, the binder could be one of those removable in an alkaline solution, such as cellulose acetate phthalate, cellulose ether phthalate, polyvinylphthalate, or polyacrylate.

Carey Lea silver may be prepared according to Luppocramer, Koll. Zeitschrift, vol. 8, p. 240, 1911.

In another embodiment, my invention comprises a photographic element having a support (or base) which has coated thereon at least one light-sensitive silver halide emulsion coating and at least one antihalation layer containing Carey Lea silver toned neutral with an aminoalkanethiol having the above general formula. Such photographic elements may be adapted for either black-and-white photography or color photography and may have a plurality of light-sensitive silver halide emulsion layers. They may also have one or more antihalation layers, for instance, an antihalation layer on each side of the support. Any of the conventional supports may be used, such as cellulose acetate, paper, glass, metals such as aluminum as is used in lithography, a polyester such as polyethyl-

ene terephthalate, polystyrene, polyolefins such as polyethylene, etc.

The support may be given a preparatory treatment in order to improve adhesion, such as electron bombardment, oxidation or flame treating, or other treatments known in the art.

In an additional embodiment, my invention involves the process of neutral toning Carey Lea silver by mixing a liquid suspension of Carey Lea silver with an aqueous solution of the aforesaid aminoalkanethiol compounds. The toning of the Carey Lea silver occurs very rapidly upon mixing the solution and the thiol compound. It is desirable that the liquid solution also contain some gelatin or other binder in which the toned Carey Lea silver is to be dispersed when applied as an antihalation layer. After the toning of the Carey Lea silver, additional binder may be added to the resulting mixture.

The ratio of thiol to Carey Lea silver may be varied widely, from about a molar ratio of 30:1 to about 1:1. Within these limits no more than the effective amount is desirable, not only from an economic standpoint but because the thiol compounds are, in general, silver halide complexing agents and an excess could affect the processing agents. The amount of neutral toned Carey Lea silver, usually expressed as milligrams per square foot of surface area of the support of the photographic element, to be used varies depending upon the character of the support, the character of the binder in which the Carey Lea silver is dispersed and the intended use of the photographic element. Illustratively, sufficient toned Carey Lea silver is used to provide a range of from about 5 to about 100 milligrams per square foot of support surface area.

It will also be understood that the antihalation materials herein disclosed may be used with advantage in a diffusion transfer system where the light-sensitive emulsion is coated on a paper support. They may also be used in colloid transfer systems and in the formation of lithographic plates where the emulsion is coated on a support which precludes the use of an antihalation layer which must be removed in its entirety.

The light-sensitive emulsion which may be used with the toned Carey Lea silver antihalation material of this invention may be sensitized chemically or spectrally employing compounds heretofore known for such sensitization. Such material may also be used with light-sensitive acid polymer layers as disclosed in U.S. Patent No. 2,948,610; light-sensitive cinnamic acid ester polymers disclosed in U.S. Patent No. 2,690,966; bichromate sensitized materials such as those disclosed in U.S. Patent No. 2,448,861; the light-sensitive layers described in U.S. Patent No. 3,903,800; and in the product described in U.S. Patent No. 2,607,683.

These antihalation layers are particularly valuable when used with color emulsions, particularly those that have dye-forming couplers contained therein which react with the oxidation products of a paraphenylene diamine type developing agent. They may also be used with the color type emulsions in which the dye-forming coupler is supplied from the processing solution. In these processes, it is conventional to use a bleach step such as an oxidizing bleach in removing the silver image. This bleach step bleaches the Carey Lea silver antihalation layer rendering it transparent, but permitting such layer to remain as part of the photographic element. It will be appreciated that such antihalation layers can be used whether the color element is on an opaque support such as paper or whether it is on a transparent support such as film base. It is also useful in conventional multilayer photographic elements, and in those color processes where the multilayer color element is used to produce the color print by diffusion to a mordanted receiving sheet, although in this particular adaptation it would not be necessary to bleach the Carey Lea silver antihalation layer.

The annexed drawing illustrates diagrammatically a photographic element comprising a neutral toned Carey Lea silver antihalation layer made and used in accordance

5

with this invention. The antihalation layer 1, comprising a neutral toned Carey Lea silver dispersed in gelatin, is disposed on a cellulose acetate film support 2. On top of the antihalation layer 1, are a plurality of color layers 3, 4 and 5 which comprise light-sensitive silver halide gelatin emulsions containing dye-forming couplers, each layer of which is sensitized to a respective light range so that the resulting element will contain images in the cyan, magenta and yellow colors. A conventional filter layer 6 is interposed between color layers 3 and 4 and comprises a dispersion in gelatin of untoned Carey Lea silver having its natural yellow color.

It is to be understood that, although the photographic element depicted in the drawing is a multilayered product intended for color photography, a photographic element intended for black-and-white photography might comprise merely support 2, antihalation layer 1, and a light-sensitive silver halide emulsion layer disposed in the position of layer 5, but not having the dye couplers used to make color layers.

The following examples are intended to illustrate my invention but not to limit it in any way.

EXAMPLE 1

The antihalation underlayer coated over a cellulose acetate support consisted of, on each square foot, 258 milligrams of gelatin and 17.6 milligrams of Carey Lea silver. Preparation was as follows:

	Milliliters
Carey Lea silver (31.9 milligrams of silver per gram of 5% gelatin solution) -----	6.0
Diethylaminoethanethiol-HCl in water, 5% -----	39.0
Sodium hydroxide, 0.25 N -----	3.0

The above components were held 10 minutes at 45° C., with stirring.

Fifty milliliters of 5 percent gelatin were added and the mixture was chill-set, shredded, and washed under running water (40° F.) for 2 hours.

A hardener and coating aid were added before coating.

EXAMPLE 2

Portions of the antihalation underlayer of Example 1 were easily bleached and rehalogenated in approximately 1 second at room temperature in each of the following solutions:

(1) Potassium ferricyanide -----	grams--	100.0
Potassium bromide -----	do----	20.0
Water to make 1.0 liter.		
(2) Potassium dichromate -----	grams--	9.5
Concentrated sulfuric acid -----	milliliters--	12.0
Potassium bromide -----	grams--	10.0
Water to make 1.0 liter.		
(3) Potassium permanganate ¹ -----	grams--	2.0
Concentrated sulfuric acid -----	milliliters--	10.0
Water to make 1.0 liter.		

¹ No rehalogenation results with this solution.

A portion of the bleached area in each case was easily fixed in 1 minute at room temperature using Kodak Fixing Bath F-5.

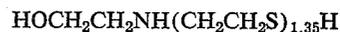
The effect on the color of Carey Lea silver by the compounds shown below was determined by the following procedure: One milliliter of Carey Lea silver dispersion containing 25 milligrams of silver per gram of 5 percent gelatin solution which had the characteristic yellow color was spread on a glass surface. Several drops of a saturated solution of the compounds listed below were added to the Carey Lea silver solution and mixed thoroughly. The moisture was evaporated off leaving the thin coating. The color of the layer was observed by transmitted and reflected light. The compounds listed below were effective in toning the yellow Carey Lea silver to a neutral.

2-hydroxyethylamino oligoethylene sulfide-1

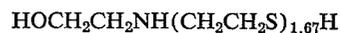


6

2-hydroxyethylamino oligoethylene sulfide-1.35



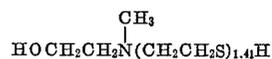
2-hydroxyethylamino oligoethylene sulfide-1.67



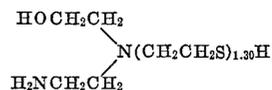
2-hydroxyethylamino oligoethylene sulfide-2



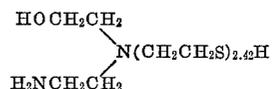
10 N-(2-hydroxyethyl)-N-methylamino oligoethylene sulfide-1.41



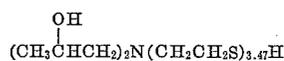
15 N-(2-aminoethyl)-N-hydroxyethylamino oligoethylene sulfide-1.30



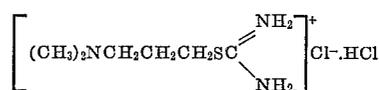
20 N-(2-aminoethyl)-N-hydroxyethylamino oligoethylene sulfide-2.42



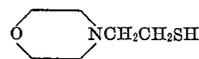
25 Bis(2-hydroxy-1-propyl)amino oligoethylene sulfide-3.47



30 3-dimethylaminopropylisothiuronium chloride hydrochloride

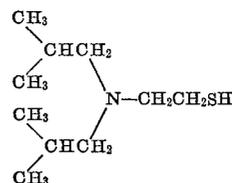


35 Morpholinoethanethiol



40 2-allylaminoethanethiol $\text{CH}_2=\text{CHCH}_2\text{NHCH}_2\text{CH}_2\text{SH}$

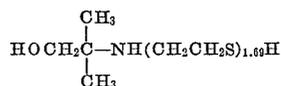
45 Di-sec-butylaminoethanethiol



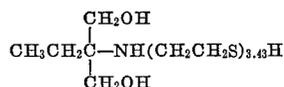
50 2-dimethylaminoethylmercapto zinc chloride hydrochloride



55 2-hydroxy-1,1-dimethylethylamino oligoethylene sulfide-1.69



60 1,1-(dihydroxymethyl)-propylamino oligoethylene sulfide-3.43



65 N-methylglucosylamino oligoethylene sulfide-3.1



75

EXAMPLE 3

A fast bromiodide emulsion, optically sensitized to green light and containing a magenta forming pyrazolone coupler was coated over the following:

- (1) A plain gelatin layer.
- (2) A regular CLS layer.
- (3) A CLS layer toned neutral by the method described in the invention. Spectrophotometric measurements in this layer confirmed the neutrality of this layer.

All coatings were made on clear cellulose acetate support. Coatings were given sensitometric exposure and processed to a color reversal, employing a bleach step to remove the silver image.

Two sets of samples were exposed. A blue exposure was used for one set to measure the inherent emulsion sensitivity. The second set was given a minus blue exposure to measure the green sensitivity. The following sensitometric data were obtained.

Feature	Minus blue exposure		Blue exposure	
	D _{max}	Rel. speed	D _{max}	Rel. speed
Emulsion over clear gelatin.....	2.04	100	2.12	100
Emulsion over CLS.....	1.52	71	1.60	71
Emulsion over CLS toned neutral.....	1.98	57	2.12	71

The lower speed for the latter two coatings is expected and indicative of the light absorption by the undercoat.

The D_{max} data indicate that there is no significant reduction in density when the neutral toned CLS is used.

Regular CLS is unsuitable as a color film underlayer because of its efficiency in catalyzing physical development during the first black-and-white development step, thereby removing silver halide from the adjacent coupler-containing layer. Less silver halide remains for the second or color development step, resulting in a lower maximum density. Toning the CLS by the method of this invention, in addition to providing a neutral color, reduces its catalytic activity for physical development, thereby permitting its incorporation in a color film.

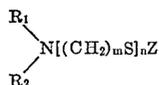
Spectral sensitivity curves show the toned Carey Lea silver to have as good a neutral tone throughout the visible spectrum as a carbon neutral density filter except for slightly more transmission in the red region.

It was possible to obtain an optical density of 0.7 from a silver coverage of 17.6 mg. of silver/sq. ft. leading to a covering power of about 40. The covering power of gray silver is less than 30. The toned Carey Lea silver in one embodiment was therefore 1.3 times more efficient in light absorption than was the gray silver.

The invention has been described in detail with particular reference to preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention as described hereinabove and as defined in the appended claims.

I claim:

1. A toned Carey Lea silver comprising Carey Lea silver which has been reacted with sufficient thiol compound to tone said silver gray, said thiol compound comprising at least one compound having the general formula:



wherein R₁ and R₂ are selected from the class consisting of H, lower alkyl, lower hydroxyalkyl, lower polyhydroxyalkyl, and nonmetallic atoms necessary to complete the heterocyclic ring from 5 to 6 atoms, m represents an integer of 1-5, n represents a number between 1 and 4 and Z represents a moiety replaceable by silver.

2. A toned Carey Lea silver of claim 1 in which the said silver has been reacted with said thiol compound in a molar ratio of 1:30 to 1:1.

3. A photographic element comprising a support having thereon at least one layer comprising a toned Carey Lea silver of claim 1.

4. A photographic element comprising a support having thereon at least one layer comprising a toned Carey Lea silver of claim 1 in which said Carey Lea silver has been reacted in a molar ratio of 1:1 to 1:30 with said thiol compound.

5. A photographic element comprising a support having thereon at least one antihalation layer comprising Carey Lea silver reacted in a molar ratio of at least one part diethylaminoethanethiol HCl per part of said silver.

6. A photographic element comprising a support having thereon at least one antihalation layer comprising Carey Lea silver reacted in a molar ratio of at least one part 2-hydroxyethylaminoethanethiol sulfide per part of said silver.

7. A photographic element comprising a support having thereon at least one antihalation layer comprising Carey Lea silver reacted in a molar ratio of at least one part 2-hydroxy-1,1-dimethylethylaminoethanethiol sulfide per part of said silver.

8. A photographic element comprising a support having thereon at least one antihalation layer comprising Carey Lea silver reacted in a molar ratio of at least one part morpholinoethanethiol per part of said silver.

9. A photographic element comprising a support having thereon at least one antihalation layer comprising Carey Lea silver reacted in a molar ratio of at least one part 1,1 - (dihydroxymethyl) - ethylaminoethanethiol sulfide per part of said silver.

10. A photographic element comprising a support having thereon at least one antihalation layer comprising Carey Lea silver reacted in a molar ratio of at least one part tris - (hydroxymethyl) - methylaminoethanethiol sulfide per part of said silver.

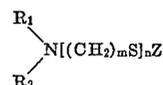
11. A photographic element comprising a support having thereon at least one antihalation layer comprising Carey Lea silver reacted in a molar ratio of at least one part bis(2 - hydroxy - 1 - propyl)aminoethanethiol sulfide per part of said silver.

12. A photographic element comprising a support having thereon at least one antihalation layer comprising Carey Lea silver reacted in a molar ratio of at least one part N-methyl glucosylaminoethanethiol sulfide per part of said silver.

13. A photographic element comprising a support having thereon at least one antihalation layer comprising Carey Lea silver reacted in a molar ratio of at least one part N - (2 - aminoethyl) - 2 - hydroxyethylaminoethanethiol sulfide per part of said silver.

14. A photographic element comprising a support having thereon at least one antihalation layer comprising Carey Lea silver reacted in a molar ratio of at least one part zinc salt of diethylaminoethanethiol HCl per part of said silver.

15. A process of toning Carey Lea silver comprising reacting Carey Lea silver with sufficient thiol compound to tone said silver gray, said thiol compound comprising at least one compound having the general formula:



wherein R₁ and R₂ are selected from the class consisting of H, lower alkyl, lower hydroxyalkyl, lower polyhydroxyalkyl, and nonmetallic atoms necessary to complete the heterocyclic ring of from 5 to 6 atoms, m represents an integer of 1-5, n represents a number between 1 and 4 and Z represents a moiety replaceable by silver.

16. A process for toning Carey Lea silver comprising reacting the Carey Lea silver in a molar ratio of at least one part diethylaminoethanethiol HCl per part of said silver.

17. A process for toning Carey Lea silver comprising reacting the Carey Lea silver in a molar ratio of at least one part 2 - hydroxyethylaminooligoethylene sulfide per part of said silver.

18. A process for toning Carey Lea silver comprising reacting the Carey Lea silver in a molar ratio of at least one part 2 - hydroxy - 1,1 - dimethylethylaminooligoethylene sulfide per part of said silver.

19. A process for toning Carey Lea silver comprising reacting the Carey Lea silver in a molar ratio of at least one part morpholinoethanethiol per part of said silver.

20. A process for toning Carey Lea silver comprising reacting the Carey Lea silver in a molar ratio of at least one part 1,1 - (dihydroxymethyl) - ethylaminooligoethylene sulfide per part of said silver.

21. A process for toning Carey Lea silver comprising reacting the Carey Lea silver in a molar ratio of at least one part tris - (hydroxymethyl) - methylaminooligoethylene sulfide per part of said silver.

22. A process for toning Carey Lea silver comprising reacting the Carey Lea silver in a molar ratio of at least one part bis(2 - hydroxy - 1 - propyl) - aminooligoethylene sulfide per part of said silver.

23. A process for toning Carey Lea silver comprising reacting the Carey Lea silver in a molar ratio of at least one part N - methylglucosylaminooligoethylene sulfide per part of said silver.

24. A process for toning Carey Lea silver comprising reacting the Carey Lea silver in a molar ratio of at least

one part N - (2 - aminoethyl) - 2 - hydroxy - ethylaminooligoethylene sulfide per part of said silver.

25. A process for toning Carey Lea silver comprising reacting the Carey Lea silver in a molar ratio of at least one part zinc salt of diethylaminoethanethiol HCl per part of said silver.

26. A photographic element comprising a support having thereon at least one layer comprising a toned Carey Lea silver of claim 3 and at least one light sensitive silver halide emulsion.

27. A photographic element comprising a support having thereon at least one layer comprising a toned Carey Lea silver of claim 3 in which said Carey Lea silver has been reacted in a molar ratio of 1:1 to 1:30 with said thiol compound, and at least one light sensitive silver halide emulsion.

References Cited

UNITED STATES PATENTS

2,688,601	9/1954	Herz	-----	96-84
3,232,759	2/1966	White et al.	-----	96-52 XR

NORMAN G. TORCHIN, *Primary Examiner*.

RONALD H. SMITH, *Assistant Examiner*.

U.S. Cl. X.R.

252-300; 96-52, 58