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PHOTOGRAPHIC PRODUCT, COMPOSITION AND PROCESS

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ABSTRACT OF THE DISCLOSURE

A combination of a reductone silver halide developing agent such as an anhydro dihydro amino reductone silver halide developing agent, with an aminomethyl hydroquinone silver halide developing agent, such as 2-methyl-5-morpholinomethyl hydroquinone or 2-methyl-5-piperidinomethyl hydroquinone, in a photographic diffusion transfer system provides reduced stain as well as desired sensitometric properties at reduced concentration levels. This combination is especially useful in a black and white silver salt diffusion transfer system. A combination wherein the described aminomethyl hydroquinone silver halide developing agent is employed in a photographic element and the described reductone silver halide developing agent is employed in a processing composition used for developing a latent image in a diffusion transfer system is especially suitable. The described combination of developing agents can be used in combination with other photographic developing agents, such as cinnamic acid developing agents, lactone developing agents or developing agent precursors, such as coumarin developing agents or developing agent precursors, and/or pyrimidine developing agents.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to combinations of photographic developing agents and to photographic elements, processing compositions, especially developer compositions and to processes employing such combinations of developing agents. In one of its aspects the invention relates to a combination of a reductone silver halide developing agent, such as an anhydro dihydro amino reductone silver halide developing agent with an aminomethyl hydroquinone silver halide developing agent and photographic elements, processes and/or processing compositions, especially those employed in diffusion transfer systems. In another of its aspects the invention is directed to processing compositions such as viscous processing compositions designed for diffusion transfer systems containing the described combination of developing agents.

Description of the prior art

In recent years diffusion transfer photographic systems, processes, compositions and elements therefor have become well known. The main advantage of the diffusion transfer process is that a positive print can be produced in a single step without resort to separate processing steps. The diffusion transfer process in brief is characterized by the use of a photographic emulsion layer and an image receiver or precipitating layer contiguous to the emulsion layer. After exposure of the photographic emulsion layer, typically a processing composition such as a developer composition is applied between the exposed photographic emulsion layer and the image receiver or precipitating layer. The processing composition usually contains a silver halide solvent such as sodium thiosulfate which

causes the unexposed silver salts usually silver halide to dissolve forming a silver complex which diffuses to the image receiver or precipitating layer where development nuclei for an image precipitating agent in that layer causes the silver to be precipitated from the silver complex imagewise. Development nuclei or precipitating agents can be present in the image receiving layer before contact with the complex silver or the nuclei can be formed in situ. Diffusion transfer photographic processes, elements and compositions for such processes are well known and described, for example, in U.S. Pat. 2,698,237 of Land issued Dec. 28, 1954; U.S. 2,647,056 of Land issued July 28, 1953; U.S. 3,108,001 of Green issued Oct. 22, 1963; and U.S. 3,345,166 of Land issued Oct. 3, 1967.

A process composition employed in diffusion transfer processes normally contains a developing agent and is usually applied as a viscous fluid layer spread between the photographic layer and the image receiving layer.

The requirements for developing agents for diffusion transfer systems are very stringent and relatively few of the developing agents which are satisfactory for general silver halide developing processes are satisfactory or sufficiently active for diffusion transfer systems. One of the diffusion transfer developing agents used more successfully is a 2,4-diaminophenol, such as 2,4-diaminophenol-dihydrochloride, also known as Amidol. However, although such developing agents will produce a positive image they are subject to rapid oxidation which results in an unsightly and objectionable dark oxidation product which stains the positive print.

Surprisingly developing agents which have been employed successfully in developing silver halide emulsions in general photographic processing have not provided the desired reduction in stain. This is illustrated in the following comparative Examples 2, 3 and 4, in which it is demonstrated that 6-methoxy-2,4-diaminophenol, hydroquinone, and tertiary butyl hydroquinone did not provide a desired reduction in stain.

Thus there has been a need for developing agents which provide desired sensitometric properties and developing action without objectionable stain or oxidation products.

There has also been a need for developing agent combinations which provide desired sensitometric properties and developing action with objectionable stain or oxidation products at reduced concentration levels.

Accordingly, it is an object of the invention to provide improved photographic elements, compositions and processes especially diffusion transfer processes and photographic elements and compositions therefor employing the described combination of developing agents which provide reduced stain without loss of desired sensitometric properties at reduced concentration levels.

SUMMARY OF THE INVENTION

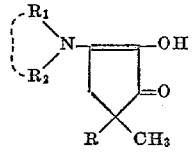
According to the invention, reduced stain without loss of desired sensitometric properties, at reduced concentration levels, is provided in diffusion transfer systems employing photographic products, elements, processing compositions, and processes with a combination of a reductone silver halide developing agent and an aminomethyl hydroquinone silver halide developing agent. This combination is especially suitable in a black and white silver salt diffusion transfer system. A combination of an anhydro dihydro amino reductone silver halide developing agent, such as anhydro dihydro piperidino hexose reductone, with an aminomethyl hydroquinone silver halide developing agent, such as 2-methyl-5-morpholinomethyl hydroquinone or 2-methyl-5-piperidinomethyl hydroquinone, in a photographic diffusion transfer system provide especially suitable results.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A wide range of reductone silver halide developing agents can be employed in the practice of the inevntion. These include any reductone silver halide developing agents, especially anhydro dihydro reductone silver halide developing agents, which provide desired developing activity and reduction of stain without adversely affecting desired maximum density, minimum density, photographic speed, gamma, and other desired sensitometric properties.

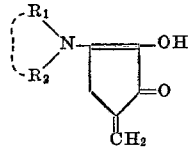
A wide variety of reductone silver halide developing agents can be employed in the practice of the invention. Suitable reductone silver halide developing agents include, for example, compounds of the formula:

(I)



or

(II)



wherein R_1 and R_2 are each hydrogen, alkyl, especially alkyl containing 1 to 5 carbon atoms such as methyl, ethyl, propyl, butyl and pentyl; or atoms completing a heterocyclic nucleus, especially a 5 or 6 membered heterocyclic nucleus, including, for example, a second nitrogen or an oxygen atom, such as morpholino, piperazino, pyrrolidino, piperidino and the like; R is hydrogen or hydroxyl.

The described reductone silver halide developing agents employed in the practice of the invention are typically amino hexose reductones, anhydro amino hexose reductones and anhydro dihydro amino hexose reductones. Such compounds are derived from sugars, especially D-glucose although other 6-carbon or hexose reducing sugars such as D-galactose, D-mannose, D-fructose, L-sorbose or the like can be used. A typical method of preparing the described amino hexose reductones and anhydro amino hexose reductones comprises heating in a reaction medium, substantially free of water, a hexose reducing sugar and an aliphatic or cyclic secondary amine in the presence of an acidic, reductone forming, catalytic agent such as phosphoric acid, boric acid, acetic acid or succinic acid. The removal of three moles of water results during the formation of the described amino hexose reductones. The described anhydro amino hexose reductones can be prepared by heating hydrochloride salts of the amino glucose reductones further in the presence of strong acids such as sulfuric acid, acetic anhydride, zinc chloride, and the like, to remove another mole of water. A suitable method for preparing the described amino hexose reductones and anhydro amino hexose reductones is set out in U.S. Pat. 2,936,308 of Hodge issued May 10, 1960. Corresponding dihydro anhydro amino reductones can be prepared from the corresponding anhydro amino reductones by a process of hydrogenation in the presence of a suitable catalyst such as Raney nickel. The preparation of anhydro dihydro piperidino hexose reductone is typical of the method which can be employed for the preparation of dihydro anhydro amino reductones employed in the practice of the invention. In this prepartion typically one mole of anhydrous D-glucose and 1.3 moles of piperidine are stirred together in absolute ethanol under nitrogen for 15 minutes. The resulting mixture is then heated on a steam bath and stirred until the solution is homogeneous. Then a solution of glacial acetic acid and absolute ethanol is added dropwise to the resulting mixture. The solution is stirred and refluxed under nitrogen for about 12 hours, cooled, transferred to a suitable container and stored. The resulting crystals which form are filtered, followed by washing with and recrystallizing from ethanol. The resulting piperidino hexose reductone is dehydrated with a butanol solution of anhydrous hydrogen chloride to form the desired anhydro piperidino hexose reductone. This product is then hydrogenated in ethanol over Raney nickel to form the desired anhydro dihydro piperidino hexose reductone. The resulting product can be purified if desired such as by recrystallization from ethanol.

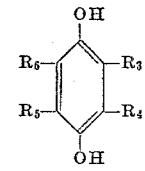
Suitable reductone silver halide developing agents which can be employed in the practice of the invention include, for example:

dimethylamino hexose reductone
diallylamino hexose reductone
di-n-butylamino hexose reductone
di-n-hexylamino hexose reductone
morpholino hexose reductone
piperazino di(hexose reductone)
pyrrolidino hexose reductone
piperidino hexose reductose
anhydro dimethylamino hexose reductone
anhydro diallylamino hexose reductone
anhydro-di-n-hexylamino hexose reductone
anhydro morpholino hexose reductone
anhydro piperazino di(hexose reductone)
anhydro pyrrolidino hexose reductone
anhydro piperidino hexose reductone
4-methyl piperidino hexose reductone
2,6-dimethylmorpholino hexose reductone
N-benzyl-N-methylamino hexose reductone
anhydro-4-methyl-piperidino hexose reductone
anhydro-2,6-dimethylmorpholino hexose reductone
anhydro-N-benzyl-N-methylamino hexose reductone

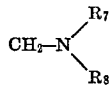
Other suitable reductone compounds include the corresponding anhydro dihydro hexose reductones, such as:

anhydro dihydro dimethylamino hexose reductone
anhydro dihydro diallylamino hexose reductone
anhydro dihydro di-n-hexylamino hexose reuctone
anhydro dihydro morpholino hexose reductone
anhydro dihydro piperazino di(hexose reductone)
anhydro dihydro pyrrolidino hexose reductone
anhydro dihydro piperidino hexose reductone
anhydro dihydro 4-methyl-piperidino hexose reductone
anhydro dihydro 2,6-dimethylmorpholino hexose reductone
anhydro dihydro N-benzyl-N-methylamino hexose reductone

A wide variety of aminoalkyl hydroquinone silver halide developing agent can be used in the practice of the invention in combination with the described reductone silver halide developing agents. These include any aminoalkyl hydroquinone silver halide developing agent which provides desired developing activity and reduction of stain without adversely affecting desired maximum density, minimum density, photographic speed, gamma and other sensitometric properties. Aminoalkyl hydroquinone silver halide developing agents which are suitable in the practice of the invention include, for example, compounds of the formula:



wherein R_3, R_4, R_5 and R_6 are each hydrogen, alkyl, especially alkyl containing 1 to 5 carbon atoms, as described, alkoxy, e.g. alkoxy containing 1 to 5 carbon atoms, such as methoxy, ethoxy, propoxy, butoxy, or pentoxy, or aminomethyl;



wherein R_7 and R_8 are each hydrogen, alkyl, especially alkyl containing 1 to 5 carbon atoms, as described, or atoms completing a heterocyclic nucleus, especially a 5- or 6-membered heterocyclic nucleus, as described; at least one of R_3, R_4, R_5 and R_6 being aminomethyl as described.

Suitable aminomethyl hydroquinone silver halide developing agents which can be employed in the practice of the invention include, for example:

2-morpholinomethyl hydroquinone
2-piperazinomethyl hydroquinone
2-piperidinomethyl hydroquinone
2-pyrrolinomethyl hydroquinone
2-pyridinomethyl hydroquinone
2-pyrimidinomethyl hydroquinone
2,5-dimorpholinomethyl hydroquinone
2,5-dipiperazinomethyl hydroquinone
2,5-dipiperidinomethyl hydroquinone
2-methyl-5-morpholinomethyl hydroquinone
2-methyl-5-pyrrolidinomethyl hydroquinone
2-methyl-5-piperidinomethyl hydroquinone
2-methoxy-5-morpholinomethyl hydroquinone
2-methyl-5-bis(hydroxyethyl) aminomethyl hydroquinone
2-t-butyl-5-morpholinomethyl hydroquinone

The described aminomethyl hydroquinone compounds are typically employed in the form of their acid salt, e.g., their chloride, hydrochloride, sulfate or other salts such as alkali metal salts, e.g., sodium or potassium salts. The hydroquinone compounds as described can be employed either in their salt form or in their salt-free form.

The described aminomethyl hydroquinone compounds can be prepared by a Mannich base condensation reaction. In such a reaction, a base such as morpholine, piperidine, piperazine or the like is mixed with paraformaldehyde. These can be mixed in a suitable solvent such as isopropyl alcohol. The reaction mixture can be allowed to stand at room temperature, e.g. about 20° C. to 30° C., or can be heated if desired. The resulting reaction produces the desired product. The product can be separated from the reaction mixture with isopropyl alcohol or acetone. The desired product can be recovered by recrystallization from isopropyl alcohol. A typical procedure for the preparation of the described compounds is set out in the Journal of Organic Chemistry, vol. 29, p. 2640 (1964).

Another method of preparing the described aminomethyl hydroquinone compounds is reacting a N-(alkoxymethyl) heterocyclic nitrogenous base with a hydroquinone compound such as 2-methyl hydroquinone in a suitable solvent. A spontaneous reaction occurs which is usually exothermic. Upon reaction completion, the desired hydroquinone compound is produced. This usually crystallizes from the reaction mixture. The desired product can be separated from the reaction mixture by crystallization and filtration. It can be purified by recrystallization from a suitable solvent such as benzene or the like. A suitable preparation of this type is described, for example, in Canadian Pat. No. 766,263, isued Aug. 29, 1967.

The described silver halide developing agents can be employed in the practice of the invention in a range of physical locations in a diffusion transfer photographic system. Each can be employed in one or more layers of a photographic element and/or in a processing composition if desired. The optimum location will depend upon several factors such as the desired image, processing conditions and the like. For example, the described silver halide developing agents can be employed in a processing composition, such as an aqueous alkaline developer solution, and/or they can be incorporated into one or more layers of a photographic element such as the photographic silver halide emulsion layer, a layer between the support and the silver halide emulsion layer and/or an overcoat layer. Suitable diffusion transfer systems, processes, processing compositions and elements therefor which can be employed in the practice of the invention are described, for example, in U.S. Pat. 2,352,014 of Rott issued June 20, 1944, U.S. Pat. 2,452,181 of Land issued Feb. 27, 1951, and U.S. Pat. 3,337,342 of Green issued Aug. 27, 1967. They can be used in so-called high-speed diffusion transfer processes and compositions therefor as described, for example, in U.S. Pat. 3,326,683 of Land et al. issued June 20, 1967, or in other types of diffusion transfer systems, processes and compositions therefor such as described in U.S. Pat. 2,857,274 of Land et al. issued Oct. 21, 1958; U.S. Pat. 3,020,155 of Yackel et al. issued Feb. 6, 1962; U.S. Pat. 2,584,030 of Land issued Jan. 29, 1952; and U.S. Pat. 2,923,623 of Land issued Feb. 2, 1960. These references also describe typical photographic products suitable for diffusion transfer systems comprising in combination (a) a photographic element comprising a photographic silver salt layer, e.g., a photographic silver halide layer, (b) a processing composition containing a silver halide solvent and a silver halide developing agent, typically in a rupturable container, and (c) an image receiver.

Accordingly, one embodiment of the invention comprises: in a photographic product comprising in combination (a) a photographic element comprising photographic silver halide, (b) a processing composition containing a silver halide solvent and (c) an image-receiving layer, the improvement comprising a reductone silver halide developing agent and an aminomethyl hydroquinone silver halide developing agent. The described reductone silver halide developing agent and/or the described aminomethyl hydroquinone silver halide developing agent can be employed in the photographic element, and/or in the processing composition and/or in the image-receiving layer or a layer contiguous thereto.

The described developing agents can be employed for developing an image in a wide range of photographic emulsions. They can be employed in such an emulsion if desired. The photographic emulsions employed in the practice of the invention can be X-ray or other nonspectrally sensitized emulsions or they can contain spectral sensitizing dyes such as described in U.S. Pat. 2,526,632 of Brooker et al. issued Oct. 24, 1950, and U.S. Pat. 2,503,776 of Sprague issued Apr. 11, 1960. Spectral sensitizers which can be used include, for example, cyanines, merocyanines, complex (trinuclear) cyanines, complex (trinuclear) merocyanines, styryls and hemicyanines.

Various photographic silver salts can be used in the practice of the invention. These include photographic silver halides such as silver bromide, silver chloride, as well as mixed halides such as silver bromoiodide, silver chloroiodide and the like.

The photosensitive layers and/or image-receiving layers which can be employed in the practice of the invention can be coated on a wide variety of supports. Suitable supports include, for example, those generally employed for photographic elements such as cellulose nitrate film, cellulose ester film, poly(vinylacetal) film, polystyrene film, poly(ethylene terephthalate) film and related films or resinous materials; as well as papers, such as paper supports coated with resinous materials, e.g., paper coated with alpha-olefin polymers, particularly polymers of alpha-olefins containing 2 to 4 carbon atoms as exemplified by polyethylene, polypropylene, ethylene-butene copolymers or the like; as well as glass, metal and the like. The supports or layers coated on them, typically paper supports, can contain fluorescent brightening agents, such as stilbenes, benzothiazoles and benzoxazoles.

The photographic elements and image-receiver layers employed in the practice of the invention typically contain binding materials suitable for photographic purposes. These include natural and synthetic binding materials generally employed for this purpose such as gelatin, colloidal

albumin, water-soluble vinyl polymers, cellulose derivatives, acrylamide polymers, polyvinylpyrollidone and the like. Mixtures of binding agents can also be used. The binding agents for a photographic emulsion of a photographic element as described can also contain other dispersed polymerized vinyl compounds. Such compounds are described, for example, in U.S. Pat. 3,142,568 of Nottorf issued July 28, 1964; U.S. Pat. 3,193,383 of White issued July 6, 1965; U.S. Pat. 3,062,674 of Houck, Smith and Yudelson issued Nov. 6, 1962; U.S. Pat. 3,220,844 of Houck, Smith and Yudelson issued Nov. 30, 1965; and include the water-insoluble polymers of alkyl acrylates and methacrylates, acrylic acid, sulfoalkyl acrylates or methacrylates and the like. The described elements can also contain stripping layers and/or antistatic layers, i.e., conducting layers.

Photographic emulsion employed in the practice of the invention can also contain compounds which are speed-increasing addenda such as quaternary ammonium compounds, polyethylene glycols or thioethers. Frequently, useful effects can be obtained by adding the described speed-increasing compounds to the processing solutions instead of or in addition to the photographic emulsions.

Photographic silver halide emulsions employed in the practice of the invention can be chemically sensitized using any of the well-known techniques in emulsion making such as by digesting with naturally active gelatin or various sulfur, selenium, tellurium, and/or noble metal sensitizer and/or reduction sensitizers. Combinations of sensitizers can be empolyed such as described in U.S. Pat. 3,297,446 of Dunn issued Jan. 10, 1967, and U.S. Pat. 3,408,196 of McVeigh issued Oct. 29, 1968.

The described silver halide developing agents employed in the practice of the invention can be employed in combination with addenda known in the art to be useful in processing photographic elements, especially those employed in photographic diffusion transfer systems. Various suitable addenda include hardeners such as described in British Pat. 974,317; buffers which maintain desired developing activity and/or pH level; coating aids, plasticizers; and stabilizing agents such as sodium sulfite or sodium formaldehyde bisulfite.

The described silver halide developing agents employed in the practice of the invention can be used in colloid transfer processes and photographic elements therefor such as described in U.S. Pat. 2,596,756 of Yutzy et al. issued May 13, 1952. They can also be used in photographic elements and/or in processing composition intended for use in monobath processing such as described in U.S. Pat. 2,875,048 of Haist et al. issued Feb. 24, 1959, and British Pat. 1,063,844 of Beavers et al. published Mar. 30, 1967. They can also be used in so-called web-type processing such as described in U.S. Pat. 3,179,517 of Tregillus et al. issued Apr. 20, 1965.

The described silver halide developing agents employed in the practice of the invention can also be used in multilayer, single-element diffusion transfer systems such as those which utilize undeveloped silver halide in nonimage areas of a negative to form a positive by physical development of this silver onto a nuclei-containing contiguous image-receiving layer after which the upper layer is removed by scrubbing, washing, stripping or other suitable method. Processes of this type are described, for example, in U.S. Pat. 3,020,155 of Yackel et al. issued Feb. 6, 1962.

Good results are obtained in photographic elements when they are processed by use of a so-called external processing web containing the described silver halide developing agents in combination with a silver halide solvent and other processing or coating components dispersed in a vehicle and coated on a suitable suport. Processing webs of this type are described, for example, in U.S. Pat. 3,179,517 of Tregillus et al. issued Apr. 20, 1965.

The described silver halide developing agents employed in the practice of the invention can be present in one or more layers of the photographic element designed for recording color images. For example, these compounds can be employed in one or more layers of a photographic element containing a photographic layer sensitive to the blue region of the spectrum, a photographic layer sensitive to the green region of the spectrum, and a photographic layer sensitive to the red region on the spectrum. Layers sensitive ot the blue, green and red regions of the spectrum can contain any suitable sensitizing dyes. Photographic elements designed for recording color images in which the described reductone silver hailde developing agents employed in the practice of the invention can be used are described, for example, in Mees' The Theory of the Photographic Process, third edition, 1966, pages 382–396.

The described developing agents employed in the practice of the invention can be used in an element containing development nuclei or image-precipitating nuclei such as an image-receiver layer. As described, they can also be employed in photographic elements or processing composition designed for use with an image receiver.

Development nuclei or silver precipitating agents which can be employed in diffusion transfer systems, as described, can be physical development nuclei or chemical precipitants including, for example, (a) heavy metals in colloidal form and salts of these metals, (b) salts of amines which form silver salts and/or (c) nondiffusing polymeric materials with functional groups capable of combining with silver amines.

Suitable development nuclei and/or silver image precipitating agents include metal sulfides, selenides, polysulfides, polyselenides, thiourea and its derivatives, stannous halides, silver, gold, platinum, palladium and mercury, colloidal sulfur, amino guanidine sulfate, amino guanidine carbonate, arsenous oxide, sodium stannite, hydrazines, xanthates and similar agents disclosed, for example, in U.S. Pat. 3,020,155 of Yackel et al. issued Feb. 6, 1962. A nondiffusing polymeric silver precipitant or development nuclei such as polyvinyl mercapto acetate can also be employed. A wide range of concentrations of development nuclei or silver precipitating agents can be employed. A concentration of the development nuclei or silver precipitant in the image-receiving layer must be at least sufficient to insure the development of a positive image and sufficient removal of undeveloped silver salt from the light-sensitive layer to be processed. Usually, the concentration of total developing agents as described is about 3 to about 320 milligrams per square foot of the layer containing the precipitants and/or development nuclei.

The described silver halide developing agents employed in the practice of the invention can be employed in combination with any silver halide developing agent. The reductone silver halide developing agents and/or aminomethyl hydroquinone silver halide developing agent employed in the practice of the invention can be employed in such combinations as auxiliary developing agents or as the main component of the development combination. Suitable silver halide developing agents which can be employed in combination with the described developing agents include, for example, polyhydroxybenzenes, such as hydroquinone developing agents; catechol and pyrogallol; chloro-substituted hydroquinone such as chlorohydroquinone or dichlorohydroquinone; alkoxy-substituted hydroquinone such as methoxy hydroquinone or ethoxy hydroquinone; aminophenol developing agents such as 2,4-diaminophenols and methyl aminophenols; ascorbic acid developing agents such as ascorbic acid, ascorbic acid ketals, and ascorbic acid derivatives as described, for example, in U.S. Pat. 3,337,342 of Green issued Aug. 22, 1967; hydroxyl amine developing agents such as N,N-di(2-ethoxyethyl) hydroxyl amine; 3-pyrazolidone developing agents such as 1-phenyl-3-pyrazolidone and 1-phenyl-4-methyl - 4 - hydroxymethyl-3-pyrazolidone, including those described in British Pat. 930,572 published July 3, 1963; and acyl derivatives of para amino phenol such as

described in British Pat. 1,045,303 published Oct. 12, 1966. Such developing agents can be used alone or in combination.

The following compounds can also be used in the described system:

1-phenyl-3-pyrazolidone
hydroquinone
methyl hydroquinone
tertiary butyl hydroquinone
3,6-dihydroxy benzonorbornane
2,4-diamino-6-methyl phenol dihydrochloride
4-phenyl catechol
tertiary butyl pyrocatechol
2,4-diaminophenol dihydrochloride
ascorbic acid
N-methyl-p-aminophenol sulfate
N,N'-ethylene di(oxymethyl) pyridinium perchlorate
2-(3-sulfopropyl)-2-thiopseudo urea
7,14 - diazo - 6,15 - dioxoeicosane - 1,21 - bis(pyridinium perchlorate)

The described compounds can, for instance, be incorporated in a photographic element employed in a diffusion transfer system, as described, which after exposure can be developed employing a processing composition containing a developing agent as described. One or more of the described combination of compounds can be in a photographic element and/or processing composition, e.g., a developer composition employed in the practice of the invention. For example, a photographic element can contain a 3-pyrazolidone developing agent and/or a 2,4-diaminophenol developing agent and/or other described addenda and be developed employing a processing composition containing a developing agent as described.

The developing agents employed in the practice of the invention can be employed in a photographic silver salt emulsion designed for diffusion transfer processing and/or in a processing composition designed for such processing. A typical processing composition employed in diffusion transfer systems is described, for example, in U.S. Pat. 3,120,795 of Land et al. issued Feb. 11, 1964.

Accordingly, another embodiment of the invention is a photographic processing composition, especially a liquid processing composition, comprising (a) a silver halide solvent and (b) a reductone silver halide developing agent and aminomethyl hydroquinone silver halide developing agent. A photographic processing composition as described wherein the reductone silver halide developing agent is an anhydro dihydro reductone silver halide developing agent is especially suitable.

This composition is typically employed in a combination of (a) a photographic element comprising an aminomethyl hydroquinone silver halide developing agent and a photographic silver salt, (b) a viscous processing composition comprising:

(1) A silver halide solvent,

(2) An alkaline development activator, and

(3) A reductone silver halide developing agent as described, especially an anhydro dihydro reductone silver halide developing agent, and (c) an image receiving layer comprising development nuclei, especially palladium development nuclei, dispersed in a polymeric binder.

A processing composition employed in the practice of the invention is typically a viscous processing composition. A wide range of suitable viscosity can be employed. The viscosity is usually about 20 to about 100,000 centipoise. Various thickening agents are suitable in the described processing compositions and processes of the invention. Any of those commonly employed in diffusion transfer photographic systems can be employed as well as those employed in viscous monobaths. These include those described in U.S. Pat. 3,120,795 of Land et al., issued Feb. 11, 1964, such as hydroxy ethyl cellulose and carboxy methyl cellulose.

The described developing agents can be used in viscous monobaths. Suitable viscous monobaths in which the described silver halide developing agents can be employed are set out, for example, in the Monobath Manual by Grant M. Haist (1966), and U.S. Pat. 3,392,019 of Barnes et al. issued July 9, 1968.

A wide range of silver halide solvents can be employed in the process of the invention. Usually, this silver halide solvent is sodium thiosulfate; however, various organic silver halide complexing agents such as those described in Haist et al. Photographic Science and Engineering, Vol. 5, page 198 (1961) and described in French Pat. 1,312,-687, issued Nov. 12, 1962 and Belgian Pat. 606,559 of Ulrich et al., issued July 26, 1960 and similar agents can also be used.

Another embodiment of the invention comprises in a photographic diffusion transfer process comprising developing a latent image in a photographic silver salt layer and precipitating an image in an image receiver layer the improvement comprising developing said latent image with a combination of a reductone silver halide developing agent and an aminomethyl hydroquinone silver halide developing agent, as described. The described developing agents are especially suitable in such a process which is a black and white silver salt diffusion transfer process.

The described process is carried out at a pH which activates the described reductone silver halide developing agent and aminomethyl hydroquinone silver halide developing agent. The activating pH is usually about 10 to about 14 with good results being obtained when the pH is above about 12. When the pH of the system is lowered to less than about 8, e.g. less than 8, to about 2, developing activity stops. The optimum pH for any particular diffusion transfer system will be influenced by the particular photographic element, the desired image, various addenda employed in the processing composition, emulsion and image receiver, processing conditions and the like. Any development activator can be employed which provides the desired pH. Typical development activators which can be employed are alkali metal hydroxides such as sodium hydroxide, potassium hydroxide or lithium hydroxide as well as organic development activators such as amines, e.g., 2-aminoethanol, 2-methylaminoethanol, 2-dimethylaminoethanol, 2-ethylaminoethanol, 2-diethylaminoethanol, 2,2' - diiminodiethanol, 5 - diethylamino-2-pentenol, and the like.

A photographic process according to the invention accordingly can comprise the steps of exposing a photographic element comprising an aminomethyl hydroquinone silver halide developing agent and comprising a photographic silver salt layer to form a latent image therein, developing the resulting latent image with a processing composition comprising a reductone silver halide developing agent as described at a pH of about 12 to about 14, contacting undeveloped silver salts in the photographic silver salt layer with a silver halide solvent to form an imagewise distribution of a silver complex in the unexposed areas of the photographic silver salt layer, transferring at least part of the silver complex to an image-receiver layer, contiguous to the photographic silver complex in the presence of development nuclei, to form a visible image in the receiver layer.

Processing conditions, time of development and the like can vary depending on several factors such as the desired image, the particular components of the described photographic element, processing composition and image receiver. Typical processing is carried out under normal atmospheric conditions and is completed within about 60 seconds, e.g., within about 10 seconds. Processing temperatures are typically about 20° C. to about 30° C., but elevated temperatures can be employed if desired, such as temperatures up to about 90° C.

The described photographic element, receiving element and/or processing composition can also contain toning

agents. Typical toning agents which can be employed include, for example, polyvalent inorganic salts as described in U.S. Pat. 2,698,236 of Land issued Dec. 28, 1954; silica as described in U.S. Pat. 2,698,237 of Land issued Dec. 28, 1954; and heterocyclic mercaptans such as mercaptoazoles, e.g., mercaptodiazoles, mercaptotriazoles and mercaptotetrazoles.

An especially suitable process as described comprises a photographic diffusion transfer process wherein the described reductione silver halide developing agent is an anhydro dihydro piperidino hexose reductone and the described aminomethyl hydroquinone silver halide developing agent is 2-methyl-5-pyrrolidinomethyl hydroquinone, 2-methyl-5-morpholinomethyl hydroquinone, or 2-methyl-5-piperidino methyl hydroquinone.

The concentrations of the described developing agents employed in the practice of the invention can vary over wide ranges depending on the particular photographic and physical variables present in the system. For example, the location of the developing agents in the system, the photographic element, processing composition, the desired image, processing conditions and the like will determine the suitable range for each of the described developing agents. Suitable concentrations also depend on the particular addenda present in the photographic element to be processed and/or in the processing composition. Typically, when one of the described developing agents according to the invention is employed in the photographic element, it is employed in the concentration of about 0.01 to about 5 moles of developing agent per mole of silver present in the photographic element. When a developing agent as described is employed in the processing composition, the total concentration of developing agents in the system is typically about 0.01% to about 10%, preferably about 1% to about 5% by weight of the total developer composition.

It is often advantageous to have an antifoggant present in the processing composition and/or photographic elements processed according to the invention. Suitable antifoggants include organic antifoggants, such as benzotriazole, benzimidazole, 2-mercaptobenzimidazole, nitroindazole and mercaptotetrazole antifoggants. The developer compositions of the invention can contain inorganic antifoggants such as potassium bromide, potassium iodide and/or sodium bromide. The concentration of antifoggant in either the processing composition or photographic element can very depending upon the resired image or the components present, processing conditions and the like. The processing composition typically contains less than about 2% by weight of the antifoggant and the antifoggant is usually in the range of about 0.01% to about 2% by weight of the total processing composition.

Especially good results can be obtained in the practice of the invention when the described reductone silver halide developing agents and aminomethyl hydroquinone silver halide developing agents are employed in combination with other silver halide developing agents such as hydroxy cinnamic silver halide developing agents and/or lactone silver halide developing agents or developing agent precursors and/or pyrimidine silver halide developing agents. One or more of these developing agents according to the practice of the invention are suitable in a range of physical locations in the described diffusion transfer system. One or more can be employed in one or more layers of the photographic element and/or processing composition and/or in an image receiver. For example, one or more of the described developing agents can be employed in the processing composition such as an aqueous alkaline developer solution and one or more can be incorporated in a layer of a photographic element such as a silver salt emulsion layer, an overcoat layer, a layer between the emulsion layer and the support, and/or some other layer contiguous to the silver salt to be developed. The described developing agents can be employed in such combinations as auxiliary developing agents or one or more can be used as a main component of the developing combination or developing precursor combination. A variety of hydroxy cinnamic acids and/or amino cinnamic acid developing agents can be employed in combination with the described combination of developing agents in the practice of the invention.

Suitable cinnamic acid developing agents include, for example:

Beta-4-dimethyl-2,5-dihydroxy cinnamic acid
4-methyl-2,5-dihydroxy cinnamic acid
6-bromo-4-methyl-2,5-dihydroxy cinnamic acid
2-hydroxy-5-amino cinnamic acid
Beta-methyl-2-hydroxy-4 - methoxy-5-amino cinnamic acid
Beta-4-dimethyl-2-hydroxy-5-amino cinnamic acid
Beta-methyl-2,5-dihydroxy-4-methoxy cinnamic acid
2-hydroxy-5-methylamino cinnamic acid
4-t-butyl-2,5-dihydroxy cinnamic acid
2,5-dihydroxy cinnamic acid
2,5-dihydroxy-3,4,6-trimethyl cinnamic acid
2,3-dihydroxy cinnamic acid

Cinnamic acid silver halide developing agents in a diffusion transfer system are described, for example in U.S. patent application Ser. No. 764,301 of Oftedahl filed Oct. 1, 1968.

Typically the described cinnamic acid silver halide developing agents are derived from corresponding hydroxy coumarin and/or amino coumarin developing agent precursors. Suitable amino coumarin and/or hydroxy coumarin compounds which can be employed in the practice of the invention include, for example:

8-hydroxy coumarin
6-hydroxy-5,7-dimethoxy coumarin
6-hydroxy-4,7-dimethyl coumarin
6-hydroxy-5,7-diethoxy-4-methyl coumarin
6-hydroxy coumarin
8-hydroxy-4-methyl coumarin
6-hydroxy-4-methyl coumarin
7-(benzyloxy)-6-hydroxy coumarin
6-hydroxy coumarin-5-sulfonic acid
6-hydroxy coumarin-5-sulfinic acid
4,6-dihydroxy coumarin
8-amino coumarin
6-amino coumarin
6-amino-5,7-dimethoxy coumarin
8-amino-4-methyl coumarin
6-amino-5,7-diethoxy-4-methyl coumarin
6-amino-8-hydroxy coumarin
6-hydroxy-8-amino coumarin
6,7-dihydroxy-4-methyl-3,4-dihydro coumarin
7,8-dihydroxy-4-methyl-3,4-dihydro coumarin

5-hydroxy-2-coumaran-one and/or 7-hydroxy-2-coumaran-one compounds which are developing agent precursors can also be employed.

Lactone developing agent precursors, such as hydroxy coumarin and/or amino coumarin developing agent precursors are set out in U.S. application Ser. No. 764,301 of Oftedahl filed Oct. 1, 1968.

The following examples are included for a further understanding of the invention.

EXAMPLE 1

This illustrates a combination of a reductone silver halide developing agent with an aminomethyl hydroquinone silver halide developing agent in a diffusion transfer system according to the invention.

A processing composition is prepared by mixing the following components:

	G.
Potassium sulfite	50.0
Sodium thiosulfate pentahydrate	40.0
Potassium iodide	1.6
Potassium hydroxide	16.7
Sodium hydroxide	17.5
Anhydro dihydro piperidino hexose reductone	5.0
Hydroxy ethyl cellulose (Natrosol 250H, a trade name for hydroxy ethyl cellulose sold by the Hercules Powder Co., U.S.A.)	30.0

Water to 1 liter.

The resulting processing solution is a viscous liquid.

A photographic element is prepared by coating a gelatin solution containing 2-methyl-5-morpholinomethyl hydroquinone on electron bombarded polyethylene coated paper support at 240 milligrams of gelatin per square foot and 50 milligrams of the described aminomethyl hydroquinone developing agent per square foot. Over this layer is coated a coarse grain silver bromoiodide gelatin-polymer emulsion containing 5 mole percent iodide, 125 milligrams of silver per square foot and 320 milligrams of gelatin per square foot. An image receiver is prepared by coating a water resistant paper support with palladium development nuclei dispersed in a polymeric binder. The described photographic element is sensitometrically exposed. The processing composition as described is then squeezed between the photographic element and the image receiver and the resulting so-called sandwich is pressed together by running it between two rollers. After 20 seconds, the so-called sandwich is peeled apart and the resulting image on the image receiver is observed.

Employing this procedure and the described photographic element, processing composition and image receiver, a good positive image is produced on the receiver having a maximum density of 1.55, a minimum density of 0.01 and no oxidation or other stain.

Employing an identical diffusion transfer system as a control, but without the described reductone development agent in the processing composition, a relative speed is obtained for the positive image of 100 with a maximum density of 1.15. The process, photographic element and composition employed in the practice of the invention as set out in this example also provide a relative speed of 100. This indicates that the developer combination according to the invention provides increased maximum density without loss of desired sensitometric properties.

A comparison of oxidation stain provided by other developing agents compared to a developing agent combination employed in the practice of the invention in a diffusion transfer system is set out in the following examples.

EXAMPLE 2

This is a comparative example.

A processing composition is prepared the same as in Example 1 with the exception that in the place of the described reductone silver halide developing agent a developing agent which is 6-methoxy-2,4-diaminophenol dihydrochloride is employed.

A photographic element is prepared by coating a gelatino high speed silver bromoiodie photographic emulsion as described in Example 1 on a polyethylene coated paper support. An image receiver is employed whcih is identical to that in Example 1. The photographic element does not contain an incorporated developing agent. The photographic element is sensitometrically exposed. The processing composition as described is then squeezed between the photographic element and the image receiver and the resulting so-called sandwich is pressed together by running it between two rollers. After 20 seconds, the so-called sandwich is peeled apart and the resulting image on the image receiver is observed, especially for oxidation stain. Employing this procedure a positive image is produced which has heavy yellow or orange stain.

EXAMPLE 3

This is a comparative example.

The procedure set out in Example 2 is repeated with the exception that hydroquinone is employed as the developing agent in place of 6 - methoxy-2,4-diaminophenol dihydrochloride.

Employing this procedure a positive image is produced which has heavy yellow or orange stain.

EXAMPLE 4

This is a comparative example.

The procedure set out in Example 2 is repeated with the exception that tertiary butyl hydroquinone is employed as the developing agent in place of the described 6-methoxy-2,4-diaminophenol dihydrochloride.

A positive image is produced employing this procedure which has very heavy yellow or orange stain.

EXAMPLES 5–16

Similar results to those set out in Example 1 are obtained employing the following aminomethyl hydroquinone silver halide developing agents in place of the described 2-methyl-5-morpholinomethyl hydroquinone of Example 1:

Example 5.—2-morpholinomethyl hydroquinone
Example 6.—2-piperazinomethyl hydroquinone
Example 7.—2-pyrrolinomethyl hydroquinone
Example 8.—2-pyridinomethyl hydroquinone
Example 9.—2-pyrimidinomethyl hydroquinone
Example 10.—2,5-dimorpholinomethyl hydroquinone
Example 11.—2,5-dipiperazinomethyl hydroquinone
Example 12.—2,5-dipiperidinomethy lhydroquinone
Example 13.—2-methyl-5-piperazinomethyl hydroquinone
Example 14.—2-methyl-5-pyrrolidinomethyl hydroquinone
Example 15.—2-methyl-5-piperidinomethyl hydroquinone
Example 16.—2-methoxy-5-morpholinomethyl hydroquinone

EXAMPLES 17–33

Similar results to Example 1 are obtained employing the following reductone silver halide developing agents in place of anhydro dihydro piperidino hexose reductone with the exception that a slightly higher concentration of the described reductone developing agents in Examples 17–33 is necessary in order to obtain the same maximum density and relative speed:

Example 17.—dimethylamino hexose reductone
Example 18.—diallyamino hexose reductone
Example 19.—di-N-butylamino hexose reductone
Example 20.—morpholino hexose reductone
Example 21.—piperazino di(hexose reductone)
Example 22.—pyrrolidino hexose reductone
Example 23.—piperidino hexose reductone
Example 24.—anhydro dimethylamino hexose reductone
Example 25.—anhydro diallyamino hexose reductone
Example 26.—anhydro morpholino hexose reductone
Example 27.—anhydro piperazino di(hexose reductone)
Example 28.—anhydro pyrrolidino hexose reductone
Example 29.—anhydro piperidino hexose reductone
Example 30.—4-methyl piperidino hexose reductone
Example 31.—2,6-dimethylmorpholino hexose reductone
Example 32.—anhydro-4-methylpiperidino hexose reductone
Example 33.—anhydro-2,6-dimethylmorpholino hexose reductone

EXAMPLE 34

The procedure set out in Example 1 is repeated with the exception that 4-amino-5,6-dihydroxy-2-methylpyrimidine is also employed in the described processing composition.

Similar results are obtained to those set out in Example 1.

EXAMPLE 35

The procedure set out in Example 1 is repeated with the exception that 4,7-dimethyl-6-hydroxy coumarin is added to the described processing composition.

Similar results to those obtained in Example 1 are obtained employing this procedure.

EXAMPLE 36

The procedure set out in Example 1 is repeated with the exception that the described aminomethyl hydroquinone silver halide developing agent is employed in the described processing composition rather than in the described photographic element.

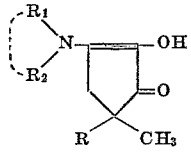
Similar results are obtained to those described in Example 1.

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.

I claim:

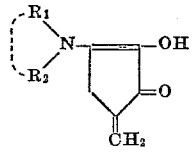
1. In a photographic product comprising in combination (a) a photographic element comprising photographic silver halide, (b) a processing composition containing a silver halide solvent, and (c) an image receiving layer, said product containing a combination of silver halide developing agents the improvement comprising a combination of (a) an amino reductone silver halide developing agent selected from the group of compounds defined by the formulas:

(I)

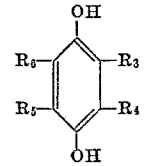


and

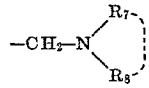
(II)



wherein R_1 and R_2 are each selected from the group consisting of hydrogen, alkyl containing 1 to 5 carbon atoms, and, taken together, atoms selected from the group consisting of carbon, hydrogen, oxygen and nitrogen atoms completing a 5 or 6 member heterocyclic nucleus; R is hydrogen or hydroxyl; and (b) an aminomethyl hydroquinone silver halide developing agent selected from the group of compounds defined by the formula:



wherein R_3, R_4, R_5 and R_6 are each selected from the group consisting of hydrogen, alkyl containing 1 to 5 carbon atoms, alkoxy containing 1 to 5 carbon atoms, and aminomethyl of the formula:



wherein R_7 and R_8 are each selected from the group consisting of hydrogen, alkyl containing 1 to 5 carbon atoms, and, taken together, atoms selected from the group consisting of carbon, hydrogen, oxygen and nitrogen atoms completing a 5 or 6 member heterocyclic nucleus; at least one of R_3, R_4, R_5 and R_6 is aminomethyl.

2. A photographic product as in claim 1 wherein said reductone silver halide developing agent is present in said processing composition and said aminomethyl hydroquinone silver halide developing agent is present in said photographic element.

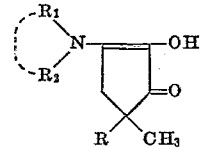
3. A photographic product as in claim 1 wherein said reductone silver halide developing agent is an anhydro dihydro amino reductone silver halide developing agent.

4. A photographic product as in claim 1 wherein said amino reductone silver halide developing agent is selected from the group consisting of piperidino hexose reductone, morpholino hexose reductone, anhydro piperidino hexose reductone, anhydro morpholino hexose reductone, anhydro dihydro piperidino hexose reductone and anhydro dihydro morpholino hexose reductone.

5. A photographic product as in claim 1 wherein said amino reductone silver halide developing agent is anhydro piperidino hexose reductone and said aminomethyl hydroquinone silver halide developing agent is selected from the group consisting of 2-methyl-5-pyrrolidino methyl hydroquinone, 2 - methyl - 5 - morpholinomethyl hydroquanone and 2 - methyl - 5 - piperidinomethyl hydroquinone.

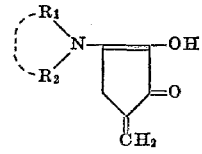
6. A photographic silver halide emulsion comprising photographic silver halide, and a combination of (a) an amino reductone silver halide developing agent selected from the group of compounds defined by the formulas:

(I)

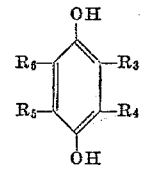


and

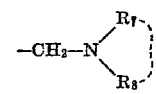
(II)



wherein R_1 and R_2 are each selected from the group consisting of hydrogen, alkyl containing 1 to 5 carbon atoms, and, taken together, atoms selected from the group consisting of carbon, hydrogen, oxygen and nitrogen atoms completing a 5 or 6 member heterocyclic nucleus; R is hydrogen or hydroxyl; and (b) an aminomethyl hydroquinone silver halide developing agent selected from the group of compounds defined by the formula:



wherein R_3, R_4, R_5 and R_6 are each selected from the group consisting of hydrogen, alkyl containing 1 to 5 carbon atoms, alkoxy containing 1 to 5 carbon atoms, and aminomethyl of the formula:



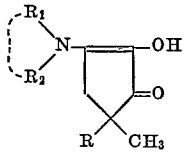
wherein R_7 and R_8 are each selected from the group consisting of hydrogen, alkyl containing 1 to 5 carbon atoms, and, taken together, atoms selected from the group consisting of carbon, hydrogen, oxygen and nitrogen atoms completing a 5 or 6 member heterocyclic nucleus; at least one of R_3, R_4, R_5 and R_6 is aminomethyl.

7. A photographic silver halide emulsion as in claim 6 wherein said amino reductone silver halide developing agent is an anhydro dihydro amino reductone silver halide developing agent and said aminomethyl hydro-

quinone silver halide developing agent is selected from the group consisting of 2-methyl-5-pyrrolidinomethyl hydroquinone, 2 - methyl - 5 - morpholinomethyl hydroquinone and 2 - methyl - 5 - piperidinomethyl hydroquinone.

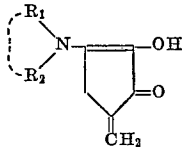
8. A photographic element comprising a support having thereon photographic silver salt, and a combination of (a) an amino reductone silver halide developing agent selected from the group of compounds defined by the formulas:

(I)

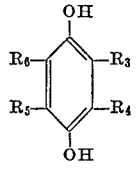


and

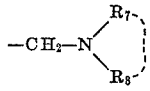
(II)



wherein R_1 and R_2 are each selected from the group consisting of hydrogen, alkyl containing 1 to 5 carbon atoms, and, taken together, atoms selected from the group consisting of carbon, hydrogen, oxygen and nitrogen atoms completing a 5 or 6 member heterocyclic nucleus; R is hydrogen or hydroxyl; and (b) an aminomethyl hydroquinone silver halide developing agent selected from the group of compounds defined by the formula:



wherein R_3, R_4, R_5 and R_6 are each selected from the group consisting of hydrogen, alkyl containing 1 to 5 carbon atoms, alkoxy containing 1 to 5 carbon atoms, and aminomethyl of the formula:



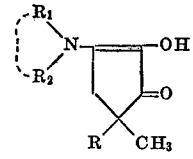
wherein R_7 and R_8 are each selected from the group consisting of hydrogen, alkyl containing 1 to 5 carbon atoms, and, taken together, atoms selected from the group consisting of carbon, hydrogen, oxygen and nitrogen atoms completing a 5 or 6 member heterocyclic nucleus; at least one of R_3, R_4, R_5 and R_6 is aminomethyl.

9. A photographic element as in claim 8 wherein said amino reductone silver halide developing agent is an anhydro dihydro amino reductone silver halide developing agent.

10. A photographic element as in claim 8 wherein said amino reductone silver halide developing agent is anhydro dihydro piperidino hexose reductone and said aminomethyl hydroquinone silver halide developing agent is selected from the group consisting of 2-methyl-5-pyrrolidinomethyl hydroquinone, 2-methyl - 5 - morpholinomethyl hydroquinone and 2-methyl-5-piperidinomethyl hydroquinone.

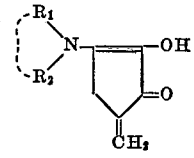
11. A photographic processing composition comprising (a) a silver halide solvent and (b) a combination of an amino reductone silver halide developing agent selected from the group of compounds defined by the formulas:

(I)

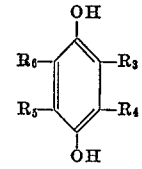


and

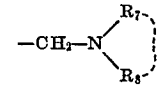
(II)



wherein R_1 and R_2 are each selected from the group consisting of hydrogen, alkyl containing 1 to 5 carbon atoms, and taken together, atoms selected from the group consisting of carbon, hydrogen, oxygen and nitrogen atoms completing a 5 to 6 member heterocyclic nucleus; R is hydrogen or hydroxyl; and (b) an aminomethyl hydroquinone silver halide developing agent selected from the group of compounds defined by the formula:



wherein R_3, R_4, R_5 and R_6 are each selected from the group consisting of hydrogen, alkyl containing 1 to 5 carbon atoms, alkoxy containing 1 to 5 carbon atoms, and aminomethyl of the formula:



wherein R_7 and R_8 are each selected from the group consisting of hydrogen, alkyl containing 1 to 5 carbon atoms, and, taken together, atoms selected from the group consisting of carbon, hydrogen, oxygen and nitrogen atoms completing a 5 to 6 member heterocyclic nucleus; at least one of R_3, R_4, R_5 and R_6 is aminomethyl.

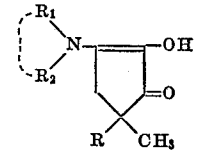
12. A photographic processing composition as in claim 11 comprising a monobath.

13. A photographic processing composition as in claim 11 wherein said amino reductone silver halide developing agent is an anhydro dihydro amino reductone silver halide developing agent.

14. A photographic processing composition as in claim 11 which is a viscous liquid.

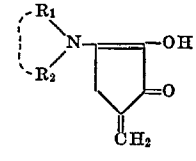
15. In a photographic diffusion transfer process comprising developing a latent image in a photographic silver salt layer and precipitating an image in an image receiver layer the improvement comprising developing said latent image with a combination of (a) an amino reductone silver halide developing agent selected from the group of compounds defined by the formulas:

(I)

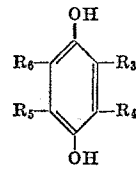


and

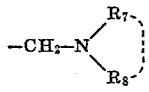
(II)



wherein R_1 and R_2 are each selected from the group consisting of hydrogen, alkyl containing 1 to 5 carbon atoms, and, taken together, atoms selected from the group consisting of carbon, hydrogen, oxygen and nitrogen atoms completing a 5 to 6 member heterocyclic nucleus; R is hydrogen or hydroxyl; and (b) an aminomethyl hydroquinone silver halide developing agent selected from the group of compounds defined by the formula:



wherein R_3, R_4, R_5 and R_6 are each selected from the group consisting of hydrogen, alkyl containing 1 to 5 carbon atoms, alkoxy containing 1 to 5 carbon atoms, and aminomethyl of the formula:



wherein R_7 and R_8 are each selected from the group consisting of hydrogen, alkyl containing 1 to 5 carbon atoms, and, taken together, atoms selected from the group consisting of carbon, hydrogen, oxygen and nitrogen atoms completing a 5 or 6 member heterocyclic nucleus; at least one of R_3, R_4, R_5 and R_6 is aminomethyl.

16. A photographic diffusion transfer process as in claim **15** wherein said process is a silver salt diffusion transfer process.

17. A photographic diffusion transfer process as in claim **15** wherein said amino reductone silver halide developing agent is an anhydro dihydro amino reductone silver halide developing agent.

18. A photographic diffusion transfer process as in claim **15** wherein said amino reductone silver halide developing agent is anhydro dihydro piperidino hexose reductone and said aminomethyl hydroquinone silver halide developing agent is selected from the group consisting of 2-methyl-5-pyrrolidinomethyl hydroquinone, 2-methyl-5-morpholinomethyl hydroquinone and 2-methyl-5-piperidinomethyl hydroquinone.

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96—61 R, 61 M, 66 R, 66 HD, 76 R