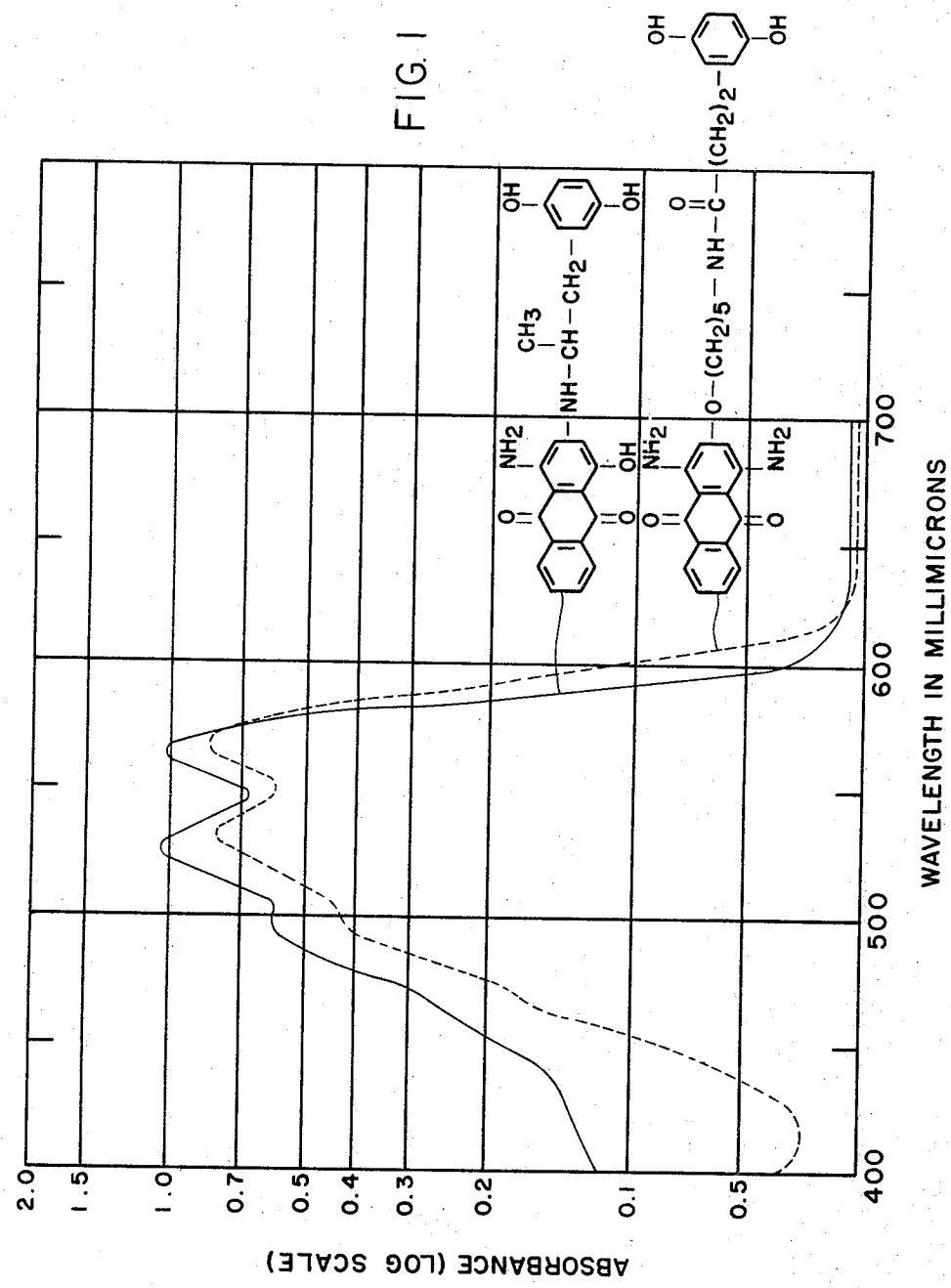
Oct. 17, 1967 J. F. DOWNEY 3,347,673

PHOTOGRAPHIC PRODUCTS, PROCESSES AND COMPOSITIONS

Filed Dec. 19, 1963

FIG. 1



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3,347,673

PHOTOGRAPHIC PRODUCTS, PROCESSES AND COMPOSITIONS

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Filed Dec. 19, 1963, Ser. No. 331,817
8 Claims. (Cl. 96—29)

This invention relates to photography and more particularly to products, compositions and processes for the development of photosensitive silver halide elements.

It is one object of the present invention to provide novel processes and compositions for the development of silver halide emulsions, in which novel colored developing agents are used.

Another object is to provide novel processes and compositions for the development of silver halide emulsions, in which the novel development agent is capable of developing an exposed silver halide emulsion and imparting a reversed or positive colored image of the developed image to a superposed image-receiving material.

A further object is to provide novel silver halide developing agents and novel products, processes and compositions suitable for use in preparing monochromatic and multichromatic photographic images.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the process involving the several steps and the relation and order of one or more of such steps with respect to each of the others, and the products and compositions possessing the features, properties and the relation of elements which are exemplified in the following detailed disclosure, and the scope of the application of which will be indicated in the claims.

The objects of this invention may be accomplished by the use of certain novel dyes which have the ability to develop images present in the exposed silver halide emulsion; thus they may be referred to as dye developers. These novel dyes or dye developers will be further described hereinafter.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawing wherein:

FIGURE 1 is a graphic illustration comparing the spectrophotometric curves of the magenta dye developers of this invention with a prior class of magenta dye developers.

The photographic processes and compositions disclosed herein are particularly useful in the treatment of an exposed silver halide emulsion, whereby a positive dye image may be imparted to another element, herein referred to as an image-carrying or image-receiving element.

U.S. Patent No. 2,983,606, issued May 9, 1961 to Howard G. Rogers, discloses diffusion transfer processes wherein a photographic negative material, such as photographic element comprising an exposed silver halide emulsion, is developed in the presence of a dye developer to impart to an image-receiving layer a reversed or positive dye image of the developed image by permeating into said emulsion a suitable liquid processing composition and bringing said emulsion into superposed relationship with an appropriate image-receiving layer. The inventive concepts herein set forth provide novel dye developers for use in such processes.

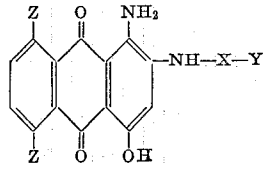
In carrying out the process of this invention, a photosensitive element containing a silver halide emulsion is exposed and wetted with a liquid processing composition, for example by immersing, coating, spraying, flowing, etc., in the dark, and the photosensitive element superposed prior to, during or after wetting, on an image-receiving element. In a preferred embodiment, the photosensitive element contains a layer of dye developer, and the liquid processing composition is applied to the photosensitive element in a uniform layer as the photosensitive element is brought into superposed position with an image-receiving element. The liquid processing composition permeates the emulsion to provide a solution of dye developer substantially uniformly distributed therein. As the exposed silver halide emulsion is developed, the oxidation product of the dye developer is immobilized or precipitated in situ with the developed silver, thereby providing an imagewise distribution of unoxidized dye developer dissolved in the liquid processing composition. This immobilization is apparently due, at least in part, to a change in the solubility characteristics of the dye developer upon oxidation, and especially as regards its solubility in alkaline solutions. It may also be due, in part, to a tanning effect on the emulsion by the oxidized developing agent. At least part of this imagewise distribution of unoxidized dye developer is transferred, by imbibition, to a superposed image-receiving layer. The image-receiving layer receives a depthwise diffusion, from the emulsion, of unoxidized dye developer, without appreciably disturbing the imagewise distribution thereof, to provide a reversed or positive, colored image of the developed or negative image. The image-receiving element may contain agents adapted to mordant or otherwise fix the diffused, unoxidized dye developer. Imbibition periods of approximately one minute have been found to give good results, but this contact period may be adjusted where necessary to compensate for variations in temperature or other conditions. The desired positive image is revealed by stripping the image-receiving layer from the silver halide emulsion at the end of the imbibition period.

The dye developers of this invention may be utilized in the photosensitive element, for example in, on or behind the silver halide emulsion, or they may be utilized in the image-receiving element or in the liquid processing composition. In a preferred embodiment, a coating or layer of the dye developer is placed behind the silver halide emulsion, i.e., on the side of the emulsion adapted to be located most distant from the photographed subject when the emulsion is exposed and preferably also adapted to be most distant from the image-receiving layer when in superposed relationship therewith. Placing the dye developer behind the emulsion layer, as in the preferred embodiment, has the advantage of providing increased contrast in the positive image, and also minimizes any light-filtering action by the colored dye developer. In this preferred embodiment, the layer of dye developer may be applied by using a coating solution containing about 0.5 to 8%, by weight, of the dye developer. Similar concentrations may be used if the dye developer is utilized as a component of the liquid processing composition. In an especially useful mode of disposing the dye developers in the photosensitive elements, the dye developer is dissolved in a water-immiscible solvent and then dispersed in a gelatin coating solution.

The liquid processing composition which is used in the processes herein disclosed comprises at least an aqueous solution of an alkaline compound, for example, diethylamine, sodium hydroxide or sodium carbonate, and may contain the dye developer. In some instances, it may contain an additional silver halide developing agent. If the liquid processing composition is to be applied to the emulsion by being spread thereon, preferably in a relatively thin, uniform layer, it may also include a viscosity-increasing compound constituting film-forming material of the type which, when spread over a water-absorbent base, will form a relatively firm and relatively stable film. A preferred film-forming material is a high molecular weight polymer such as a polymeric, water-soluble ether inert to

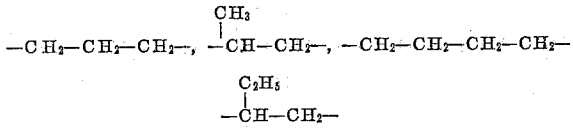
an alkali solution, as, for example, a hydroxyethyl cellulose or sodium carboxymethyl cellulose. Other film-forming materials or thickening agents whose ability to increase viscosity is substantially unaffected when left in solution for a long period of time may also be used.

The novel dye developers of this invention are anthraquinone dyes having the formula:

(A) 

wherein each Z may be hydrogen, a hydroxy or an amino group; X is an alkylene radical, preferably a lower alkylene radical containing from 1–6 carbon atoms; and Y is s-dihydroxyphenyl silver halide developing radical, e.g., p-dihydroxyphenyl, o-dihydroxyphenyl, or halogen or alkyl substituted derivatives thereof.

As illustrations of suitable alkylene radicals comprehended by X, mention may be made of radicals such as —CH_3—, —CH_2—CH_2—

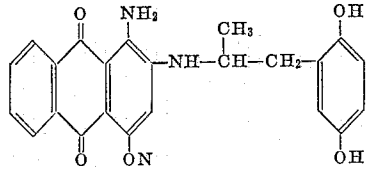


—CH_2—CH_2—CH_2—CH_2—CH_2—CH_2—, etc.

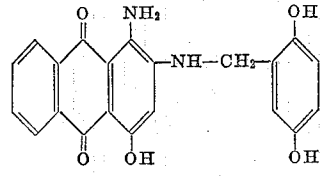
While X preferably comprises an alkylene radical having from 1–6 carbon atoms, as heretofore noted, it will be appreciated that alkylene radicals of greater length may also be employed, providing that the resulting dye developer is capable of being dissolved in the liquid processing composition described herein and its oxidation product rendered immobile.

In the preferred embodiment of the invention, Y is a paradihydroxyphenyl radical.

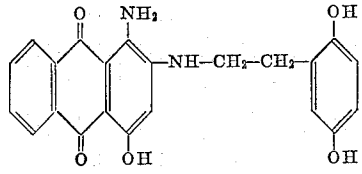
As examples of suitable dye developers within the scope of this invention, mention may be made of the following:



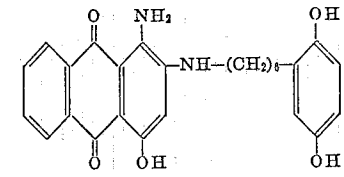
(1)
1-amino-2-(α-methyl-β-[2′,5′-dihydroxyphenyl]-ethylamino)-4-hydroxy-anthraquinone



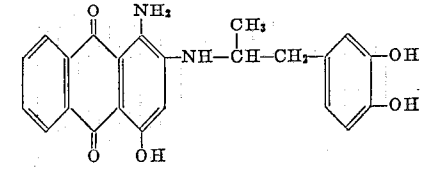
(2)
1-amino-2-(2′,5′-dihydroxyphenyl-methylamino)-4-hydroxy-anthraquinone



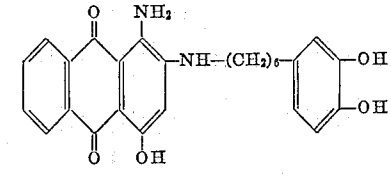
(3)
1-amino-2-(β-[2′,5′-dihydroxyphenyl]-ethylamino)-4-hydroxy-anthraquinone



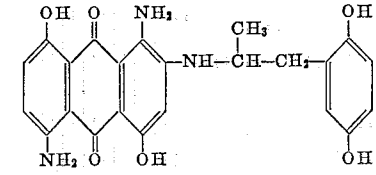
(4)
1-amino-2-(zeta-[2′,5′-dihydroxyphenyl]-hexylamino)-4-hydroxy-anthraquinone



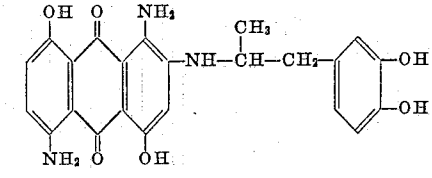
(5)
1-amino-2-(α-methyl-β-[3′,4′-dihydroxyphenyl]-ethylamino)-4-hydroxy-anthraquinone



(6)
1-amino-2-(zeta-[3′,4′-dihydroxyphenyl]-hexylamino)-4-hydroxy-anthraquinone

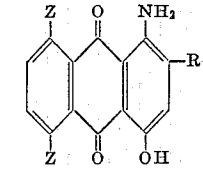


(7)
1,5-diamino-2-(α-methyl-β-[2′,5′-dihydroxyphenyl]-ethylamino)-4,8-dihydroxy-anthraquinone

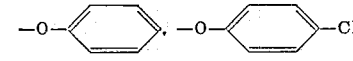


(8)
1,5-diamino-2-(α-methyl-β-[3′,4′-dihydroxyphenyl]-ethylamino)-4,8-dihydroxy-anthraquinone

The dye developers of this invention may be prepared by condensing an anthraquinone of the formula:

(B) 

wherein Z has the same meaning as above; R is a suitable halogen, preferably bromine, or a phenoxy group, e.g.,



etc.; with a compound of the formula:

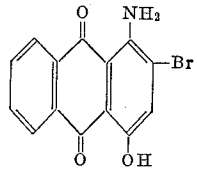
(C) NH_2—X—Y^1

wherein X has the same meaning as above and Y^1 is a protected dihydroxyphenyl silver halide developing radical, e.g., an ortho- or para-bis-alkoxyphenyl, benzyloxyphenyl radical, etc.

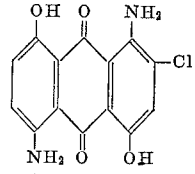
Subsequent removal of the protective groups, e.g., by hydrolysis, will provide the desired compound of Formula A.

The compounds of Formulae B and C are known in the art and per se comprise no part of the present invention.

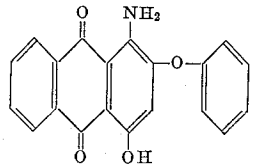
As examples of useful compounds within the scope of Formula B, mention may be made of:



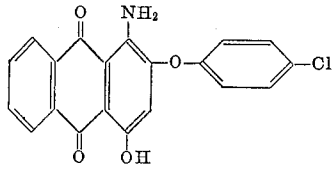
1-amino-2-bromo-4-hydroxy-anthraquinone



2-chloro-1,5-diamino-4,8-dihydroxy-anthraquinone

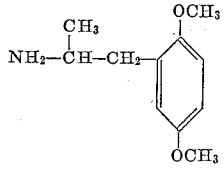


1-amino-4-hydroxy-2-phenoxy-anthraquinone

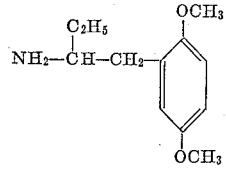


1-amino-2-(p-chlorophenoxy)-4-hydroxy-anthraquinone

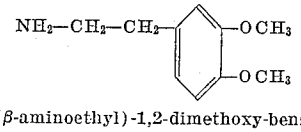
As examples of useful compounds within the scope of the Formula C mention made be made of:



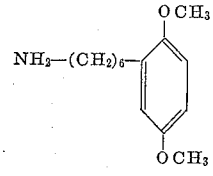
2-β-aminopropyl-1,4-dimethoxy-benzene



2-β-aminobutyl-1,4-dimethoxy-benzene



4-(β-aminoethyl)-1,2-dimethoxy-benzene

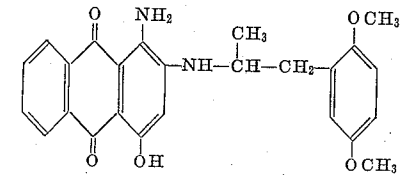


2-zeta-aminohexyl-1,4-dimethoxy-benzene

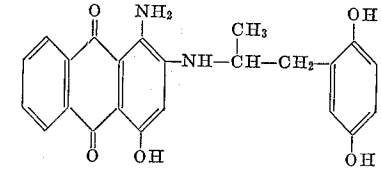
The following nonlimiting example illustrates the preparation of the novel dye developers of the invention:

Example 1

A mixture of 5 gm. of 1-amino-2-bromo-4-hydroxy-anthraquinone, 26.8 gm. of 2-β-aminopropyl - 1,4 - dimethoxy-benzene and 2.1 gm. of potassium carbonate was heated on a steam bath for 20 hours. The resulting mixture was cooled and poured into 4 liters of 2.5% HCl and ice. The precipitate was filtered and dried. The dry reddish solid was extracted with methanol leaving behind the insoluble 1-amino-2-(α-methyl-β-[2',5' - dimethoxyphenyl]-ethylamino) - 4 - hydroxy-anthraquinone, having the following structural formula:



The following analysis was obtained: Calculated: C, 69.43; H, 5.59; O, 18.50; N, 6.48. Found: C, 69.58; H, 5.58; O, 18.71; N, 6.42. A mixture of 10 gm. of 1-amino-2-(α-methyl - β-[2',5' - dimethoxyphenyl]-ethylamino)-4-hydroxy-anthraquinone (prepared in the foregoing manner) and 100 gm. of pyridine hydrochloride was heated at 225° C. for 9 minutes. The resulting solution was then poured into 3 liters of water and filtered. The resulting filter cake was crystallized from toluene-ethanol to give 1-amino - 2 - (α-methyl-β-[2',5'-dihydroxyphenyl]-ethylamino)-4-hydroxy-anthraquinone which melted at 254–261° C.; had a spectral absorption curve with $\lambda_{max.}$ at 528 and 566 mμ in methyl Cellosolve; $\epsilon_{528}=21{,}000$ and $\epsilon_{567}=20{,}500$ having the following structural formula:



The following analysis was obtained: Calculated: C, 68.30; H, 4.99; O, 19.78; N, 6.93. Found: C, 68.41; H, 5.12; O, 19.45; N, 7.10.

The following examples of the photographic utilization of the dye developers of this invention are given for purposes of illustration only:

Example 2

A photosensitive element was prepared by coating a gelatin subcoated film base at a speed of 10 feet/minute with a solution comprising 0.32 g. of 1-amino-2-(α-methyl - β - [2',5' - dihydroxyphenyl] - ethylamino)-4-hydroxy-anthraquinone [Formula 1] and 15 drops of dimethylformamide dissolved in 10 cc. of 2% cellulose acetate hydrogen phthalate in acetone. After this coating dried, a green-sensitive silver iodobromide emulsion was coated on at a speed of 5 feet/minute and allowed to dry. This photosensitive element was exposed for 2 seconds and processed by spreading, between the thus exposed photosensitive element and a superposed image-receiving element, an aqueous processing composition comprising:

Water, cc.	100.00
KOH, g.	11.20
Hydroxyethyl cellulose (high viscosity) [commercially available from Hercules Powder Co., under the trade name of "Natrosol 250"], g.	3.90
Benzotriazole, g.	3.50
Sodium thiosulfate, g.	0.50
N-benzyl-α-picolinium bromide, g.	2.00
Zinc nitrate, g.	0.50
Lithium nitrate, g.	0.50

The image-receiving element was prepared in accordance with the disclosure of the copending application of Edwin H. Land, Ser. No. 234,864, filed Nov. 1, 1962, and comprised a layer of a 2:1 mixture, by weight, of polyvinyl alcohol and poly-4-vinylpyridine, a layer of polyvinyl alcohol, and a layer of a half-butyl ester of poly-(ethylene/maleic anhydride) coated on a baryta

paper support. After an imbibition period of approximately one minute, the image-receiving element was separated and contained a magenta positive image.

Example 3

The procedure described in Example 2 was repeated, except that the dye developer was dispersed in a layer of gelatin. The coating solution from which the dye developer was coated was prepared by adding 0.46 g. of the dye developer dissolved in 1.0 cc. of cyclohexanone and 1.0 cc. of N,N-diethyl-lauramide. This mixture was agitated in a Waring blendor for one minute with a solution of 5.0 g. of 10% gelatin solution, 1.3 cc. of water, and 1.0 cc. of alkanol B. 6 cc. of the resulting dye dispersion was added to 7 cc. of water containing 2.0 cc. of 12% aqueous saponin, and then coated on the gelatin subcoated film base at a speed of 10 feet/minute. Exposure and processing in the manner described in Example 2 yielded a magenta dye image.

The addition of 0.2 g. of 4'-methylphenyl-hydroquinone to the processing solution of Examples 2 and 3 gave comparable images having appreciably lower $D_{mins.}$.

Prior to the present invention, it had not been thought possible to prepare compounds within the scope of Formula A. In other words, it was not thought possible by one skilled in the art that reacting a compound of Formula B with a compound of Formula C would produce an amino substituent placed ortho to the amino group on the 1-amino-4-hydroxy-anthraquinone nucleus, since attempts to substitute an amino group in the 2-position of a 1,4-diamino-anthraquinone have been unsuccessful.

Where each Z of Formula A is hydrogen, the resulting compounds are magenta dye developers possessing excellent stability and spectral absorption characteristics. In photographic processes such as are described and claimed in the aforementioned U.S. Patent No. 2,983,606, particularly in such processes for preparing multicolor images, it is extremely desirable that the dye developers employed possess the desired spectral absorption characteristics, as well as being stable to light, heat and humidity, so as to provide a stable image of the desired color. As is frequently the case, a magneta dye of the proper color, e.g., having the proper blue transmission, may not possess the desired stability. Conversely, magenta dyes having good light stability frequently are not of the proper color, especially for use in multicolor processes.

The magenta dye developers of the present invention are of particular value in that they are both highly stable and exhibit excellent color for use in preparing color images, particularly multicolor images where optimum color reproduction is desired.

Thus, while the magenta dye developers of this invention are neither the most stable heretofore known nor do they possess the most optimum spectral absorption characteristics, they are unusual in that they combine these properties to a high degree so as to provide magenta dye developers extremely useful in the aforementioned photographic processes and products, particularly in such products and processes for preparing multicolor images.

As shown in FIGURE 1, the spectrophotometric curve of a typical magenta dye developer of this invention, specifically 1-amino-2-(α-methyl-β-[2',5'-dihydroxyphenyl]-ethylamino)-4-hydroxy-anthraquinone (solid line) is compared with a typical 2-alkoxy-1,4-diamino-anthraquinone magenta dye developer of the prior art, specifically 1,4-diamino - 2 - (ε - [2',5' - dihydroxy - hydrocinnamido]-pentoxy)-anthraquinone (dotted line), the solvent in each case being methyl cellosolve. The last-named dye developer an analogous 2-alkoxy-anthraquinone dye developers are described and claimed in copending application Serial No. 152,014, filed November 13, 1961 in the name of John F. Downey and Myron S. Simon.

While only a single species of each class of dye developers has been shown for purposes of comparison, it will be understood that the various species of the chromophoric systems illustrated in the drawing have substantially identical curves.

It will be observed that the $\lambda_{max.}$ of the dye developers of this invention are shifted more towards the violet or a lower wavelength in the visible spectrum, and they have less absorption in the red region and more absorption in the green region of the spectrum than do the illustrated prior dye developers. More specifically, the illustrated dye developer of this invention (solid line) has a spectral absorption curve with $\lambda_{max.}$ at 528 and 566 mμ; ϵ_{528}=21,000 and ϵ_{567}=20,500; while the prior 2-alkoxy dye developer (dotted line) has a spectral absorption curve with $\lambda_{max.}$ at 534 and 572 mμ; ϵ_{534}=16,300; ϵ_{572}=17,400.

The difference in spectral absorption characteristics illustrated in the graph permits the magenta dye developers of this invention to afford more desirable color balance or accuracy of color reproduction in multicolor images prepared in the manner heretofore described.

The dye developers of this invention are also useful in integral multilayer photosensitive elements for use in multicolor diffusion transfer processes. As an example of such photosensitive elements, mention may be made of the photosensitive elements disclosed and claimed in the copending U.S. application of Edwin H. Land and Howard G. Rogers, Serial No. 565,135, filed February 13, 1956, wherein at least two selectively sensitized photosensitive strata are superposed on a single support and are processed, simultaneously and without separation, with a single common image-receiving element. A suitable arrangement of this type comprises a support carrying a red-sensitive silver halide emulsion stratum, a green-sensitive silver halide emulsion stratum and a blue-sensitive silver halide emulsion stratum, said emulsions having associated therewith, respectively, a cyan dye developer, a magenta dye developer and a yellow dye developer. In one of the preferred embodiments of photosensitive elements of this type, the dye developers are disposed in separate alkali-permeable layers behind the photosensitive silver halide emulsion stratum with which they are associated.

The photosensitive elements within the scope of this invention may be used in film units which contain a plurality of photosensitive frames. The photosensitive elements of this invention are especially useful in composite roll film and film pack structures intended for use in a "Polaroid Land Camera," sold by Polaroid Corporation, Cambridge 39, Massachusetts, or a similar camera structure such, for example, as the roll film type camera forming the subject matter of U.S. Patent No. 2,435,717, issued to Edwin H. Land on February 10, 1948, or the film pack type camera shown in U.S. Patent No. 2,991,702 issued to Vaito K. Eloranta on July 11, 1961. In general, such composite roll films comprise a photosensitive roll, a roll of image-receiving material and a plurality of pods containing an aqueous alkaline processing solution. The rolls and pods are so associated with each other that, upon processing, the protosensitive element may be superposed on the image-receiving element and the pods may be ruptured to spread the aqueous alkaline processing solution between the superposed elements. The nature and construction of the pods used in such units are well known to the art. See, for example, U.S. Patents Nos. 2,543,181 and 2,634,886, issued to Edwin H. Land.

It will be noted that the liquid processing composition may contain one or more auxiliary or accelerating silver halide developing agents, such as p-methylaminophenol (Metol); 2,4-diaminophenol (Amidol); benzylaminophenol; hydroquinones; a substituted hydroquinone such as toluhydroquinone, phenylhydroquinone, or 4'-methylphenylhydroquinone; or a 3-pyrazolidone such as 1-phenyl-3-pyrazolidone. These silver halide developing agents are substantially colorless, at least in their unoxidized form. It is possible that some of the dye developer oxidized in exposed areas may be oxidized by an energy transfer reaction with oxidized auxiliary developing agent.

In addition, development may be effected in the pres-

ence of an onium compound, particularly a quaternary ammonium compound, in accordance with the processes disclosed and claimed in the copending application of Milton Green and Howard G. Rogers, Serial No. 50,851, filed August 22, 1960, now Patent No. 3,173,786.

The dye developers of this invention may be used also in conventional photographic processes, such as tray or tank development of conventional photosensitive films, plates or papers to obtain black-and-white, monochromatic or toned prints or negatives. By way of example, a developer composition suitable for such use may comprise an aqueous solution of approximately 1–2% of the dye developer, 1% sodium hydroxide, 2% sodium sulfite and 0.05% potassium bromide. After development is completed, any unreacted dye developer is washed out of the photosensitive element, preferably with an alkaline washing medium or other medium in which the unreacted dye developer is soluble. The expression "toned" is used to designate photographic images wherein the silver is retained with the precipitated dye, whereas "monochromatic" is intended to designate dye images free of silver.

It should be noted that the dye developers of this medium are self-sufficient to provide the desired color image and do not depend upon coupling reactions to produce the desired color. They thus provide a complete departure from conventional photographic color processes in which the color is produced by a coupling reaction between a "color former" or "coupler" and the oxidized developing agent, as well as so-called auto-coupling processes in which color is obtained by a reaction of the oxidized developing agent with unoxidized developing agent.

It will be apparent that, by appropriate selection of the image-receiving element from among suitable known opaque and transparent materials, it is possible to obtain either a colored positive reflection print or a colored positive transparency. Likewise, the inventive concepts herein set forth are adaptable for multicolor work by the use of special photographic materials, for example, film materials of the type containing two or more photosensitized elements associated with an appropriate number of image-receiving elements and adapted to be treated with one or more liquid processing compositions, appropriate dye developers suitable to impart the desired subtractive colors being incorporated in the photosensitized elements or in the liquid processing compositions. Examples of such photographic materials are disclosed in U.S. Patent No. 2,647,049 to Edwin H. Land.

As examples of useful image-receiving materials, mention may be made of nylon, e.g., N-methoxymethyl-polyhexamethylene adipamide, polyvinyl alcohol, and gelatin, particularly polyvinyl alcohol or gelatin containing a dye mordant such as poly-4-vinylpyridine. The image-receiving element also may contain a development restrainer, e.g., 1-phenyl-5-mercaptotetrazole, as disclosed in the copending application of Howard G. Rogers and Harriet W. Lutes, Serial No. 50,849, filed August 22, 1960, now Patent No. 3,265,498.

The dye developers herein set forth are also useful in the formation of colored images in accordance with the photographic products and processes described and claimed in U.S. Patent No. 2,968,554, issued to Edwin H. Land on January 17, 1961.

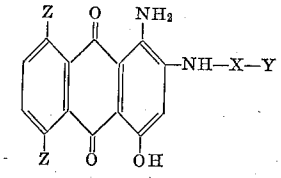
The novel compounds herein disclosed are also suitable for use as dyes for textile fibres, such as nylon.

In the preceding portions of the specification, the expression "color" has been frequently used. This expression is intended to include the use of a plurality of colors to obtain black.

Since certain changes may be made in the above products, compositions and processes without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

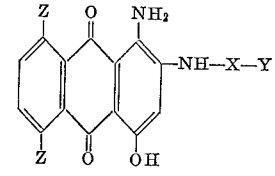
1. A novel photographic developer composition comprising an aqueous alkaline solution of a colorless silver halide auxiliary developing agent and an anthraquinone dye of the formula:



wherein each Z is selected from the group consisting of hydrogen, hydroxy and amino groups; X is a lower alkylene radical; and Y is a hydroxyphenyl silver halide developing radical.

2. A novel photographic developer composition comprising an aqueous alkaline solution of 1-amino-2-(α-methyl-β - [2′,5′ - dihydroxyphenyl] - ethylamino) - 4-hydroxy-anthraquinone and a colorless silver halide auxiliary developing agent.

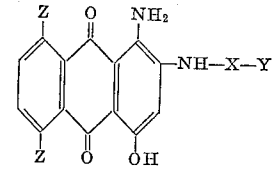
3. A novel photographic product comprising a support, a silver halide emulsion in a layer on said support, and a dye developer in a layer on the same side of said support as said emulsion, said dye developer comprising an anthraquinone dye of the formula:



wherein each Z is selected from the group consisting of hydrogen, hydroxy and amino groups; X is an alkylene radical; and Y is a dihydroxyphenyl silver halide developing radical.

4. A novel photographic product comprising a support, a silver halide emulsion in a layer on said support and 1 - amino-2-(α-methyl-β-[2′,5′ - dihydroxyphenyl]-ethylamino)-4-hydroxy-anthraquinone in a layer on the same side of said support of said emulsion.

5. In a process of forming a photographic image in color, the steps which comprise developing a latent image contained in an exposed silver halide emulsion by contatcing said emulsion with an aqueous alkaline solution containing an anthraquinone dye developer of the formula:

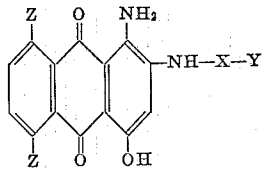


wherein each Z is selected from the group consisting of hydrogen, hydroxy and amino groups; X is an alkylene radical; and Y is a dihydroxyphenyl silver halide developing radical; oxidizing said dye developer in developed areas to provide in said emulsion a predetermined distribution of unoxidized dye developer and transferring at least part of said distribution of said unoxidized dye developer by imbibition from said emulsion to an image-receiving element in superposed relationship with said emulsion to impart to said image-receiving element a positive dye image of the developed image.

6. The process as defined in claim **5** wherein said compound is 1-amino-2-(α-methyl-β-[2′,5′-dihydroxyphenyl]-ethylamino)-4-hydroxy-anthraquinone.

7. A photographic process which comprises exposing a photosensitive silver haldie emulsion and contacting

said exposed silver halide emulsion with an aqueous alkaline solution containing an anthraquinone dye of the formula:



wherein each Z is selected from the group consisting of hydrogen, hydroxy and amino groups; X is an alkylene radical; and Y is a dihydroxyphenyl silver halide developing radical.

8. The process as defined in claim 7 wherein said compound is 1-amino-2-(α-methyl-β-[2',5'-dihydroxyphenyl]-ethylamino)-4-hydroxy-anthraquinone.

References Cited

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2,983,606	5/1961	Rogers	96—29
3,192,117	6/1965	Kaiser et al.	260—380

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Venkataraman, "Synthetic Dyes," vol. 2, page 886, Academic Press, N.Y. (1952).

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