

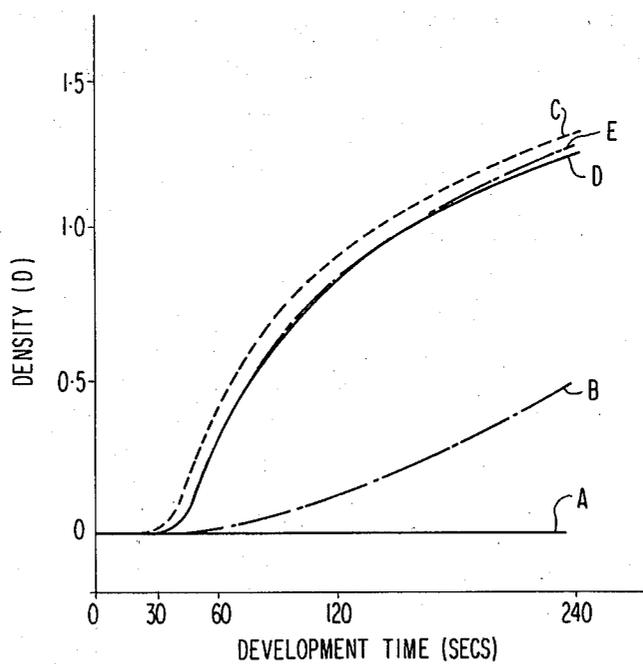
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3,822,130

METHOD FOR DEVELOPING SILVER HALIDE PHOTOSENSITIVE MATERIAL

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METHOD FOR DEVELOPING SILVER HALIDE PHOTSENSITIVE MATERIAL

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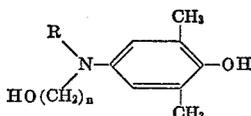
Int. Cl. C03c 5/30, 1/76, 1/06

U.S. Cl. 96-66.3

19 Claims

ABSTRACT OF THE DISCLOSURE

A photographic developing process which comprises: developing an exposed light sensitive silver halide emulsion layer of a photographic material with an alkaline solution in the presence of hydroquinone and a derivative of p-aminophenol having the formula:



wherein R is an alkyl group of from 1 to 4 carbon atoms, and n is an integer of from 2 to 5.

BACKGROUND OF THE INVENTION

(1) Field of the Invention

The present invention relates to a method for developing a silver halide photosensitive material. More particularly, it has as its object the improvement of the developing activity of hydroquinone by the use of hydroquinone in combination with a specific compound as a developing agent.

(2) Description of the Prior Art

Photosensitive materials have heretofore been prepared by coating a photosensitive silver halide emulsion on a support base, such as glass plate, paper, plastic film etc., followed by drying the coated product. After the thus prepared photosensitive material has been exposed to light, it is developed with a developer liquid, which is an alkaline aqueous solution containing a developing agent as its essential ingredient, thereafter it is subjected to the steps of stopping, fixation and various water-rinsing treatments in sequence.

Since these series of treatment procedures, however, require a long period of time, many improvements to date have been proposed in the art in order to shorten the processing time. Examples of such improved methods include high temperature processing, single bath developing and fixation, a double bath type stabilization treatment process, etc. One of the most currently employed methods for shortening the time of development comprises adding a developing agent to a silver halide emulsion layer, then treating the layer with a highly alkaline aqueous solution containing an alkali agent and other photographic additives, such as an antioxidant and a retarder. The advantageous feature of that method resides in making a quick development process possible within a shortened developing reaction time, which is brought forth by the use of a highly increased pH processing liquid. This is only possible when no developing agent is added to the processing liquid employed without causing any degradation on the storability of the liquid.

The silver halide photosensitive material to be suitably employed in that method includes a silver chloride emulsion and a silver chlorobromide emulsion having less silver

bromide content, which originally has a high rate of developing reaction.

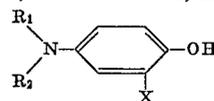
On the other hand, various attempts have been made so as to apply a similar quick process, even to a silver chlorobromide emulsion of higher silver bromide content, pure silver bromide emulsion and silver iodobromide emulsion, by adding a developing agent to these emulsions. However, since each of these silver chlorobromide solutions, pure silver bromide emulsions and silver iodobromide emulsions have a slower developing reaction rate than that of the silver chloride emulsion, it has been impossible to obtain satisfactory desirable photograph characteristics by treatment within a short period of time.

Meanwhile, it is well known in the art that excellent photographic characteristics, which have never been attained with the use of hydroquinone alone, can be obtained in the usual development process for silver halide photosensitive emulsion containing no added developer, by using a developing liquid containing hydroquinone in combination with a developing agent having super additivity, such as 1-phenyl-3-pyrazolidone and N-methyl-p-aminophenol (PQ or MQ developer). In addition, it is disclosed in the specification of U.S. Pat. No. 2,751,297 that the rate of the developing reaction is accelerated by the addition of 1-phenyl-3-pyrazolidone to a single hydroquinone solution or to MQ developer.

By utilizing these prior teachings, we have made an attempt so as to accelerate the quick developing using a silver chlorobromide emulsion, silver bromide emulsion and silver iodobromide emulsion, each containing a developing agent admixed therein. It was found, however, that the addition of these accelerators, i.e., 1-phenyl-3-pyrazolidone, N-methyl-p-aminophenol, etc. to these emulsions was unsuccessful, because these accelerator compounds are very susceptible to undergo oxidation, which in turn not only causes degradation in the activity of these compounds during storage of the resulting articles, but also results in discoloration or contamination of the support base.

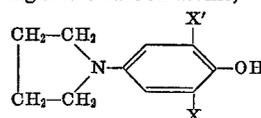
It has also been reported that certain p-amino-phenol derivatives, such as compound (I), which is disclosed in Japanese Patent Publication No. Sho. 37/5,993, and compound (II), which is disclosed in U.S. Pat. No. 3,265,499, have more excellent super additive power than the above-mentioned 1-phenyl-3-pyrazolidone and N-methyl-p-aminophenol when they are used in combination with hydroquinone.

We have also made an attempt so as to improve the above drawbacks encountered in the use of the compound set forth in the aforementioned U.S. patent, by adding such compounds to the emulsion. However, this procedure also gave unsuccessful results in that the photosensitive emulsion containing such compounds caused a fog, and a countermeasure for the prevention of fogging by resorting to the addition of a known fog inhibitor caused an appreciable drop in the developing speed. Compounds (I) and (II) of Japanese Patent Publication No. Sho. 37/5,993 and U.S. Pat. 3,265,499, discussed above, are as follows:



(I)

wherein R₁ is, for example, an alkyl group having 1 to 6 carbon atoms, R₂ is, for example, a methyl or an ethyl group and X is, for example, a methyl, an ethyl or an alkyl group having 1 to 6 carbon atoms,

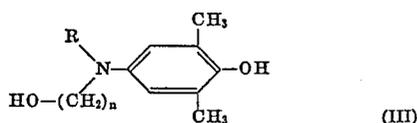


(II)

wherein each of X and X' is, for example, a hydrogen atom, a halogen atom, an alkyl group, an alkyl amino group, etc., respectively.

SUMMARY OF THE INVENTION

We have now found that the aforementioned disadvantages can now be overcome by the addition to a silver halide photographic emulsion of a compound represented by the formula (III) in combination with hydroquinone, and also that excellent photographic characteristics can be obtained by developing this photographic material with a single hydroquinone developer. We have also discovered that an alkaline developer liquid containing the compound represented by formula (III) together with hydroquinone is an excellent photographic developer liquid.



wherein R is an alkyl group containing 1 to 4 carbon atoms and n is an integer of 2 to 5.

The primary object of the present invention is to improve the photographic characteristics in a conventional rapid developing process of photographic paper, by adding the above-mentioned compound of formula (III) into the silver halide emulsion layer and/or adjacent layer, such as protective layer or undercoat layer containing a developing agent admixed thereto.

The second object of this invention is to employ a compound of the formula (III) as an essential developing agent having super additivity when being combined with hydroquinone for developing monochromic and color photography.

The third object of this invention is to accelerate the developing speed of the usual developing treatment by adding the compound of formula (III) into either one of the emulsion layer, protective layer and undercoat layer of a silver halide photosensitive material containing no developing agent added thereto.

DETAILED DESCRIPTION OF THE INVENTION

The novel developing agent of the above formula (III) may be usually used in the form of stable salts such as hydrochloride or sulfate rather than in the form of the free amine. More particularly, the compound of formula (III) identified hereinafter have proved to be very suitable for being applied in the process according to the present invention:

- (1) 4 - (N-ethyl-N- γ -hydroxypropylamino)-2,6-dimethyl phenol hydrochloride,
- (2) 4-(N - n - propyl-N- γ -hydroxypropylamino)-2,6-dimethyl phenol sulfate,
- (3) 4-(N - n - butyl-N- β -hydroxyethylamino)-2,6-dimethyl phenol hydrochloride,
- (4) 4 - (N-ethyl-N- β -hydroxyethylamino)-2,6-dimethyl phenyl hydrochloride,
- (5) 4-(N-methyl - N - β -hydroxyethylamino)-2,6-dimethyl phenol sulfate.

These compounds (III) are employed with hydroquinone in the process, material and/or alkaline solution of the present invention as follows:

Compound to be added	To—	Amount per mole of light sensitive silver halide or per liter of alkaline solution	Proportion there-between by weight
Hydroquinone.....	Layer.....	5 to 500 grams.....	1
Compound (III).....	do.....	0.05 to 50 grams....	1/100-1/10
Hydroquinone.....	do.....	5 to 500 grams.....	
Compound (III).....	Solution.....	0.01 to 20 grams.....	
Hydroquinone.....	do.....	1 to 70 grams.....	
Compound (III).....	Layer.....	0.05 to 50 grams.....	
Hydroquinone.....	Solution.....	1 to 70 grams.....	1
Compound (III).....	do.....	0.01 to 20 grams....	1/100-1/10

The effect of the addition of the compound of the general formula (III) is displayed against every one of pure silver chloride, silver chlorobromide, pure silver bromide and silver iodobromide, but an outstanding effect is obtained when it is used in combination with a silver chlorobromide, a pure silver bromide or a silver iodobromide emulsion, each of which is known to have a slower developing speed.

The development agent to be used in combination with the compounds of formula (III) in accordance with the present invention is not limited to any specific type, and it is possible to use any compound, which is conventionally used as a photographic developing agent having a reducing activity. Such developing agents typically include hydroquinone or its derivatives, catechol or its derivatives, ascorbic acid and like compounds.

The support material to be used for carrying the silver halide photosensitive material may be any one of those capable of providing a silver halide emulsion with it, and typically exemplified by paper, glass, and plastic film, which may be further provided with a baryta layer or undercoat layer.

The silver halide emulsion to be used is intended to include a silver halide photosensitive material, and may contain gelatin or another synthetic resin such as polyvinyl alcohol, polyvinyl acetal and the like.

Since the compounds of formula (III) are novel, the method for preparing the same will be explained in detail below.

SYNTHETIC EXAMPLE 1

4-(N-ethyl-N- β -hydroxyethylamino)-2,6-dimethylphenol hydrochloride

A 500 ml. autoclave was charged with 39 g. of 2,6-dimethylhydroquinone and 217 g. of a 40% aqueous ethylamine solution, then heated, after replacing the entrapped air with nitrogen, at 200° C. for 24 hours with stirring. After being allowed to cool, the reaction product mixture was poured together with 400 g. of ice into 180 ml. of concentrated hydrochloric acid to thereby gradually form the precipitation of white crystals. These crystals were collected and treated with decoloring charcoal followed by recrystallization from dilute hydrochloric acid to give 4-ethylamino-2,6-dimethylphenol hydrochloride.

A mixture comprising 10 g. of the thus prepared 4-ethylamino-2,6-dimethylphenol hydrochloride, 6.5 g. ethylene bromohydrin, 7.1 g. of anhydrous potassium carbonate and 100 ml. of ethanol was heated under reflux for 8 hours in a nitrogen atmosphere. After cooling the reaction product mixture in a nitrogen atmosphere, it was filtered under suction and the residual solid mass on the filter paper was washed twice with ethanol. The filtrate and wash liquid were combined together, and the mixture was distilled under reduced pressure to distill off ethanol to leave a residue, which was impregnated twice with hot ether. After removing the ether by distillation, it was further distilled under a reduced pressure of 1 mm./Hg. The distilled product obtained after raising the oil bath temperature to 250° C. was then dissolved in ether and dry hydrogen gas was introduced to the resulting solution to give an oily product, which soon solidified. Recrystallization of the solid product so obtained from ethanol-benzene gave the desired product.

SYNTHETIC EXAMPLE 2

4-(N-methyl-N- β -hydroxyethylamino)-2,6-dimethylphenol hydrochloride

This compound was prepared according to a manner similar to that of Example 1, from 10 g. of 4-methylamino-2,6-dimethylphenol hydrochloride, which per se was obtained by using 40 g. of 2,6-dimethyl hydroquinone and 200 g. of 40% aqueous methylamine, 6.95 g. of ethylene bromohydrin, 7.6 g. anhydrous potassium carbonate and 100 ml. of ethanol.

The present invention will be more adequately defined by reference to the following examples, which are merely intended to be illustrative and not limitative of the present invention.

EXAMPLE 1

Coating solutions were each prepared by adding a requisite hardening agent, a coating adjuvant and each developing agent as shown in Table 1, which follows, to 400 cc. of a silver halide gelatin emulsion containing 50 g. of gelatin and 20 g. of silver chlorobromide having a silver bromide content of 60 mol percent.

Each coating solution thus prepared was applied to a photographic baryta paper of 150 g./m.². The coated paper was further provided, under a set state before drying of the coated emulsion layer, with a protective coating layer consisting of 20 g. of gelatin, 6 cc. of saponin (as a 6% solution in methanol) and one liter of water, and thereafter dried to give each sample of A-G. The photographic paper thus prepared was exposed to light through an optical wedge (step wedge) and developed with the use of an activated solution having a composition as follows:

Composition of activated solution:		G.
Anhydrous sodium sulfite	-----	45
Potassium hydroxide	-----	48
Potassium bromide	-----	1.3
Water to make the entire solution to 1000 cc.		

After stabilizing this with a stabilizer solution containing ammonium thiocyanate (NH₄SCN), the photographic characteristics were measured and the results are given in Table 1 as follows:

TABLE 1

Sample	Composition of developing agents	Photographic characteristics		
		Specific sensitivity	Maximum density	Gamma
A	10 g. hydroquinone (control).	1.00	1.02	1.40
B	10 g. hydroquinone plus 0.50 g. 1-phenyl-3-pyrazolidone.	1.60	1.31	1.83
C	10 g. hydroquinone plus 0.53 g. Metol.	1.49	1.25	1.93
D	10 g. hydroquinone plus 0.63 g. 4-diethylamino-phenol hydrochloride.	1.51	1.27	1.85
E	10 g. hydroquinone plus 0.65 g. 4-diethylamino-2-methylphenol hydrochloride.	1.73	1.43	1.98
F	10 g. hydroquinone plus 0.70 g. 1-(3,5-dimethyl-4-hydroxyphenyl)pyrrolidine-HCl.	1.51	1.34	1.84
G	10 g. hydroquinone plus 0.74 g. 4-(N-ethyl-N-β-hydroxyethylamino)-2,6-dimethylphenol-HCl.	1.86	1.85	2.37

From Table 1, it will be noted that Sample G to which the compound of this invention was added exhibits a remarkably high value in every sensitivity, maximum density and gamma, and has excellent quality.

EXAMPLE 2

A coating solution was prepared by adding a necessary hardening agent and a coating additive to 400 cc. of a silver halide gelatin emulsion containing 50 g. of gelatin and 20 g. of silver iodobromide in which the silver iodide content was 1.5 mol percent. This coating solution was applied to a photographic baryta paper of 150 g./m.². The thus coated paper was further provided under a set state before drying of the coated emulsion layer, with a coating solution comprising 20 g. of gelatin, a mixture of 30 g. of hydroquinone with 1.5 g. of 4-(N-methyl-N-β-hydroxyethylamino)-2,6-dimethylphenol hydrochloride as an essential developing ingredient, 2 g. of sodium benzene sulfinate as an antioxidant for the developing agent, 3 cc. of a 30% aqueous formalin solution, 6 cc. of a 6% meth-

anol solution of saponin and one liter of water, and thereafter dried.

A comparative sample was similarly prepared, but adding no 4-(methyl-N-β-hydroxyethylamino)-2,6-dimethylphenol.

The thus prepared samples were each treated according to a manner similar to Example 1. The sample of this invention exhibited superior values in every sensitivity, maximum density and in gamma to the control sample.

EXAMPLE 3

A photographic baryta paper of 150 g./m.² was coated with a solution comprising 50 g. of gelatin, 35 g. of hydroquinone, 1.7 g. of 4-(N-ethyl-N-β-hydroxyethylamino)-2,6-dimethylphenol xylene hydrochloride, 2 g. of sodium benzene sulfinate as an antioxidant for the hydroquinone, 2 cc. of a 30% aqueous formalin solution, 1.0 g. of a fluorescent whitening agent "Blankophor BUP (trade name, manufactured by Bayer Co., West Germany)" and one liter of water. Onto this there was coated a coating solution comprising 400 cc. of a silver halide gelatin emulsion containing 20 g. of silver chlorobromide in which the content of silver bromide was 60 mol percent, and other necessary additives, such as a hardening agent and a coating adjuvant. The thus coated paper was further provided, under a set state before drying of the coated emulsion, with a protective layer by coating thereon, a solution comprising 20 g. of gelatin, 6 cc. of a 6% methanol solution of saponin and one liter of water.

On the other hand, a contrast sample was similarly prepared, but adding no 4-(N-ethyl-N-β-hydroxyethylamino)-2,6-dimethylphenol hydrochloride.

Both samples (photographic paper) thus prepared were subjected to a similar treatment to those described in Example 1. It was noted that the sample according to this invention, i.e., 4-(N-ethyl-N-β-hydroxyethylamino)-2,6-dimethylphenol was added to the undercoat layer thereof exhibited excellent photographic characteristics with extremely higher values in sensitivity, maximum density and in gamma than those obtained with the control sample.

EXAMPLE 4

A coating solution was prepared by adding a necessary hardening agent and a coating additive to 400 cc. of a silver halide gelatin emulsion containing 50 g. of gelatin and 20 g. of silver chlorobromide with a silver bromide content of 50 mol percent. The coating solution thus obtained was applied to a photographic baryta paper of 150 g./m.² to thereby prepare a photographic paper. This paper was developed with the use of a developing liquid having the following composition, and the change in density in relation to the developing period at a constant exposure dosage was plotted on the curves shown in FIG. 1.

BRIEF DESCRIPTION OF THE DRAWING

In FIG. 1, each curve indicates the following:

- Curve A: Hydroquinone, alone was used,
- Curve B: Hydroquinone was used in combination with 1-phenyl-3-pyrazolidone,
- Curve C: Hydroquinone was used in combination with Metol,
- Curve D: Hydroquinone was used in combination with 4-diethylamino-2-methylphenol hydrochloride, and
- Curve E: Hydroquinone was used in combination with 4-(N-ethyl-N-β-hydroxyethylamino)-2,6-dimethylphenol hydrochloride.

Composition of developing bath:		G.
Anhydrous sodium sulfite	-----	20
Hydroquinone	-----	3
Anhydrous sodium carbonate	-----	15
Potassium bromide	-----	1
Cooperative developing agent shown in the table above (in the molar ratio of 1/20 to hydroquinone).		
Water to make the entire solution to 1000 cc.		

FIG. 1 illustrates plotted curves showing the relation of density to the developing time of the sample obtained in accordance with an example of this invention and a comparative sample.

It will be clearly understood from the curves shown in FIG. 1 that the compound of this invention has extremely high super additivity to the developing activity.

EXAMPLE 5

A photographic baryta paper of 150 g./m.² was coated with a coating solution prepared by adding 30 g. hydroquinone and other necessary additives to every kg. of a silver halide emulsion containing 40 g. of silver chlorobromide (60 mol percent silver bromide) per 125 g. of gelatin, and then dried. The thus prepared photographic paper was exposed to light through a step wedge, then developed for 4 seconds with the activated solution used in Example 1, and thereafter stabilized with a stabilizer solution containing ammonium thiocyanate. For purposes of comparison, the same treatment was repeated, but adding to the activated solution 0.9 g. per liter of the added compound of Synthetic Example 1. The results obtained after measuring specific sensitivity, maximum density and gamma are given in Table 2.

TABLE 2

	Specific sensitivity	Maximum density	Gamma
Activated solution containing no compound of Synthetic Example 1.....	1.00	1.05	1.51
Activated solution containing the compound of Synthetic Example 1..	1.47	1.35	2.18

It will be understood from this table that the compound of Synthetic Example 1 greatly accelerates the developing activity of hydroquinone.

EXAMPLE 6

A photographic baryta paper of 150 g./m.² was coated with an emulsion containing 2.0 g. of the compound of Synthetic Example 2 per one kg. of the silver halide emulsion of Example 5 and other additives, and then dried to give a photographic paper. This photographic paper and another sample of photographic paper prepared by using an emulsion without containing the added compound of Synthetic Example 2 were each exposed to light through a step wedge, then developed for 4 seconds with an activated solution containing 20 g. of hydroquinone per liter of the solution shown in Example 1, and thereafter stabilized with a stabilizer solution containing ammonium rhodanate. The results obtained after measuring the specific sensitivity, maximum density and gamma are given in Table 3.

TABLE 3

	Specific sensitivity	Maximum concentration	Gamma
Paper containing no compound of Synthetic Example 2.....	1.00	0.68	0.30
Paper containing the compound of Synthetic Example 2.....	14.80	1.23	1.60

It is clearly understood from the above results that the compound of Synthetic Example 2 greatly accelerates the development by hydroquinone.

As having been set forth in greater detail, it will be now understood that the present invention is not only applicable to a silver halide photosensitive material containing a developing agent in the emulsion layer thereof, but also quite similarly applicable with a superior result to conventionally used silver halide photosensitive materials for photography or copying use in which no developing agent is contained in the emulsion layer thereof.

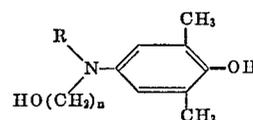
Although the present invention has been adequately described in the foregoing specification and examples in-

cluded therein, it is readily apparent that various changes and modifications can be made without departing from the spirit and scope thereof.

What is claimed is:

1. A photographic developing process which comprises:

developing an exposed light sensitive silver halide emulsion layer of a multi-layer photographic element with an alkaline solution, said developing being in the presence of hydroquinone and a derivative of p-aminophenol having the formula



wherein R is an alkyl group of from 1 to 4 carbon atoms, and n is an integer of from 2 to 5.

2. The photographic developing process of Claim 1, wherein said hydroquinone is incorporated in said emulsion layer, in an adjacent layer to said emulsion layer or in said emulsion layer and an adjacent layer to said emulsion layer, and said derivative is incorporated in said alkaline solution.

3. The photographic developing process of Claim 1, wherein said hydroquinone is incorporated in said alkaline solution, and said derivative is incorporated in said emulsion layer, in an adjacent layer to said emulsion layer, or in said emulsion layer and an adjacent layer to said emulsion layer.

4. The photographic developing process of Claim 1, wherein said hydroquinone and said derivative are incorporated in said emulsion layer, in an adjacent layer to said emulsion layer, or in said emulsion layer and an adjacent layer to said emulsion layer.

5. The photographic developing process of Claim 1, wherein said hydroquinone and said derivative are incorporated in said alkaline solution.

6. The photographic developing process of Claim 2, wherein the amount of said hydroquinone ranges from 5 to 500 grams per mole of said light sensitive silver halide emulsion.

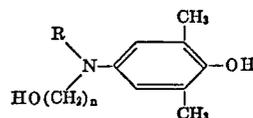
7. The photographic developing process of claim 3, wherein the amount of said derivative ranges from 0.05 to 50 grams per mole of said light sensitive silver halide emulsion.

8. The photographic developing process of claim 3, wherein the amount of said hydroquinone ranges from 1 to 70 grams per liter of said alkaline solution.

9. The photographic developing process of claim 2, wherein the amount of said derivative ranges from 0.01 to 20 grams per liter of said alkaline solution.

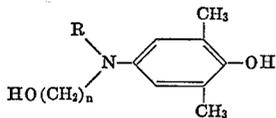
10. The photographic developing process of Claim 1, wherein said derivative is a member selected from the group consisting of 4-(N-ethyl-N-γ-hydroxy-propyl-amino)-2,6-dimethyl phenol hydrochloride, 4-(N-n-propyl-N-γ-hydroxypropylamino)-2,6-dimethyl phenol sulfate, 4-(N-n-butyl - N - β - hydroxyethylamino)-2,6-dimethyl phenol hydrochloride, 4-(N-ethyl-N-β-hydroxyethylamino)2,6-dimethyl phenol hydrochloride and 4-(N-methyl-N-β-hydroxyethylamino)-2,6-dimethyl phenol sulfate.

11. A multi-layer photographic element having at least one light sensitive silver halide emulsion layer, which contains from 0.05 to 50 grams per mole of silver halide of a derivative of p-aminophenol having the formula:



wherein R is an alkyl group of from 1 to 4 carbon atoms, and n is an integer of from 2 to 5, said p-aminophenol derivative exhibiting a super-additive developing effect when used for development in combination with hydroquinone.

12. An alkaline solution for photographic development, which contains from 0.01 to 20 grams per liter of said solution of a derivative of p-aminophenol having the formula:



wherein R is an alkyl group having from 1 to 4 carbon atoms, and n is an integer of from 2 to 5, said p-aminophenol derivative exhibiting a super-additive developing effect when used for development in combination with hydroquinone.

13. The photographic developing process of Claim 4, wherein the amount of said hydroquinone ranges from 5 to 500 grams per mole of said light sensitive silver halide emulsion.

14. The photographic developing process of Claim 4, wherein the amount of said derivative ranges from 0.05 to 50 grams per mole of said light sensitive silver halide emulsion.

15. The photographic developing process of Claim 5, wherein the amount of said hydroquinone ranges from 1 to 70 grams per liter of said alkaline solution.

16. The photographic developing process of Claim 5, wherein the amount of said derivative ranges from 0.01 to 20 grams per liter of said alkaline solution.

17. The photographic developing process according to Claim 1, wherein said hydroquinone is incorporated in any one of said emulsion layers, a protective layer adja-

cent to said emulsion layer, or an undercoat layer adjacent to said emulsion layer, and said derivative is incorporated in said alkaline solution.

18. The photographic developing process according to Claim 1, wherein said hydroquinone is incorporated in said alkaline solution, and said derivative is incorporated in any one of said emulsion layer, a protective layer adjacent to said emulsion layer, or an undercoat layer adjacent to said emulsion layer.

19. A photographic developing process according to Claim 1, wherein said hydroquinone and said derivative are incorporated in any one of said emulsion layer, a protective layer adjacent to said emulsion layer, or an undercoat layer adjacent to said emulsion layer.

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U.S. Cl. X.R.

96—67, 95