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BLEACHING SILVER IMAGES

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4 Claims. (Cl. 95—88)

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This application relates to color photography and particularly to the removal of silver images in color photography.

In photographic color processes, such as those in which a colored image is formed by development with a primary aromatic amino developing agent in the presence of a coupler compound, the silver images formed in the development are generally present in the emulsion layer after the dye images are formed. These silver images are generally removed by converting them to a silver salt which is soluble or which is removed by hypo. A bath of this type containing potassium ferricyanide and potassium bromide is disclosed in Mannes, Godowsky and Wilder U. S. Patent 2,252,718, granted August 19, 1941. A similar bath containing 50 grams of potassium ferricyanide and 20 grams of sodium chloride per liter of water, to which has been added 1 to 5 grams of potassium chromate or potassium dichromate to retard the corrosive action of the bath on iron and iron alloys, has also been used.

The ferricyanide and halide bleach baths are not entirely satisfactory in that certain optical sensitizing dyes in the emulsion layer are not destroyed by them and these may cause stain in the emulsion layer. A further disadvantage is that any ferricyanide remaining in the element may be converted to iron oxide and produce a brown stain and there is also the objectionable corrosive action on stainless steel or iron alloys unless a chromate or dichromate is used in the bath.

A bleach bath containing quinone, acid, and an organic solvent has also been used to convert silver images to silver salt in the presence of a developed dye image. A bath of this type is disclosed in Mannes and Godowsky U. S. Patent 2,113,329, page 2, column 2, lines 16 to 21. This bath cannot be used in the final stages of a color process because it destroys the dyes as well as converts the silver to a silver salt.

It is therefore an object of the present invention to provide a method of bleaching silver images which overcomes the aforementioned difficulties. A further object is to provide a method for converting the silver images to a silver salt without destroying dye images present in the emulsion layer. A still further object is to provide a bleach bath not containing iron salts.

These objects are accomplished by bleaching the silver with a strong acid solution of a quinone containing an alkali metal chloride or bromide, and substantially free of organic solvent. By "strong acid solution" I mean a solution having a pH of about 1.5 to about 3.5.

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The bleach bath employed according to my invention may be used in any process in which silver images are present in a photographic layer together with dye images. The dye images may be those formed by color development as described in Mannes, Godowsky, and Wilder U. S. Patent 2,252,718; Mannes and Godowsky U. S. Patents 2,113,329 and 2,304,940; or Jelley and Vittum U. S. Patent 2,322,027. The dyes may also be azo dyes such as those used in the silver dye bleach process of color photography. After all of the steps of color processing the photographic layer or element is treated with the bleach bath of my invention followed by hypo to remove the silver salts formed by the bleach bath.

The emulsion layers containing the silver and dye images treated according to my invention may be coated on glass supports or on supports of cellulose ester, synthetic resin, or paper.

The following examples illustrate baths which may be used according to my invention:

Example 1

Quinone	grams	5
Glacial acetic acid	cc	10
Potassium bromide	grams	10
Hydrochloric acid (35%)	cc	5
Water to	liter	1

Example 2

Quinone	grams	2.5
Glacial acetic acid	do	5
Potassium bromide	do	10
Hydrochloric acid (35%)	cc	5
Water to	liter	1

The bath was adjusted to a pH of 1.8.

Example 3

Quinone	grams	2.5
Glacial acetic acid	do	5
Potassium bromide	do	10
Concentrated sulfuric acid	cc	3
Water to	liter	1

The bath was adjusted to a pH of 1.8.

Example 4

Quinone	grams	2.5
Glacial acetic acid	do	5
Potassium bromide	do	10
Sulfamic acid	do	3
Water to	liter	1

The bath was adjusted to a pH of 1.8.

Example 5

Quinone	grams	2.5
Glacial acetic acid	do	5
Potassium bromide	do	10
Ortho phosphoric acid (85%)	cc	9
Water to	liter	1

The bath was adjusted to a pH of 1.8.

In these formulas a chloride, such as potassium chloride, may be substituted for the potassium bromide.

In place of quinone, chloroquinone or toluquinone may be used. In place of potassium chloride or bromide, ammonium or sodium chloride or bromide may be used. No organic solvent for the dyes in the emulsion should be present. The bath is followed by a dilute solution of sodium bisulfite, for example, a 1% solution to react with the retained quinone, and the element is then fixed for about four minutes in hypo, washed and dried.

This application is a continuation-in-part of my application Serial No. 541,843, filed June 23, 1944, now abandoned.

It will be understood that the example included herein is illustrative only and that my invention is to be taken as limited only by the scope of the appending claims.

I claim:

1. The method of removing only the silver images from a photographic layer containing silver and color developed dye images of the class consisting of azomethine, indaniline and indophenol dyes, which comprises treating said layer containing said silver and dye images with a strong acid solution of a quinone having a pH of 1.5 to 3.5, said solution containing an alkali-metal halide selected from the group consisting of chlorides and bromides, but being free of organic solvent, followed by fixing.

2. The method of removing only the silver images from a photographic layer containing silver and color developed dye images of the class consisting of azomethine, indaniline and indophenol dyes, which comprises treating said layer containing said silver and dye images with a hydrochloric acid solution of a quinone having a pH of 1.5 to 3.5, said solution containing an alkali-metal bromide, but being free of organic solvent, followed by fixing.

3. The method of removing only the silver images from a photographic layer containing silver and color developed dye images of the class consisting of azomethine, indaniline and indophenol dyes, which comprises treating said layer containing said silver and dye images with an aqueous solution of quinone having a pH of 1.5 to 3.5 and containing hydrochloric acid and potassium bromide, said solution being free of organic solvent, followed by fixing.

4. The method of removing only the silver images from a photographic layer containing silver and color developed dye images of the class consisting of azomethine, indaniline and indophenol dyes, which comprises treating said layer containing silver and dye images with a strong acid solution of a quinone having a pH of 1.5 to 3.5, said solution containing bromide ions but being free of organic solvent, followed by fixing.

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