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PROCESS FOR DEVELOPING COLOR FILM WITH SOUND RECORD

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4 Claims. (Cl. 96—4)

This invention relates to photographic processes, and more particularly to an improvement in the process of developing color film with sound record.

A serious problem in providing color films with a silver image sound track is in retaining this silver image in the sound track portion during development of the color film which involves contacting the film with bleach to remove silver in the emulsion layers and, in some color films, filter layers or antihalation layers which contain silver. Previous methods of retaining the silver of the sound image have included (1) redeveloping the sound image only after bleaching the film with a viscous developer; (2) bleaching only the picture image area; (3) converting the silver of the image area to silver sulfide; and (4) protecting the sound track with an adhesive tape or varnish. All of these approaches to the problem entail certain disadvantages, such as critical concentrations of reactants, a number of treatments to one area only of the film, or the use of silver sulfide which has less absorbance of infra-red radiation than silver, whereas most photocells in sound projectors are highly sensitive to infra-red radiation. It therefore appears desirable to provide an improved method of retaining the silver of the sound image during development of color films.

One object of my invention is to provide a method for retaining the silver image of the sound track of color films during the processing of the color film. Another object of my invention is to provide an improvement in the process of developing color films having a silver image sound record. Other objects of my invention will appear herein.

These and other objects of my invention are accomplished by contacting an exposed color film of the type having a color coupler dispersed in a coupler solvent and a silver image sound track, subsequent to initial development, and prior to bleaching and color development of the film, with a quaternary ammonium compound in the area of the sound track only.

I have found that when the sound track portion of the film is contacted with a quaternary ammonium compound subsequent to initial development and prior to bleaching and color development, the silver formed in the silver image portion of the film is rendered unbleachable. My invention, therefore, provides a method for retaining image silver in the sound track area of the film during subsequent processing treatments to the entire film, such as bleaching out silver in any filter layers that are present and in the picture image portion of the film. The method of the invention includes a treatment of just the sound track portion of the film to selectively retain the silver sound image in the sound track portion of the film. In addition, the invention provides a method of obtaining a metallic silver sound image in color films of the type having filter layers, such as antihalation coatings of metallic silver in gelatin, since the treatment of the sound track portion of the film renders the sound image silver unbleachable, thereby allowing removal of the metallic silver in the filter layers. Previously, the best solution to the problem of providing a sound track in color films having couplers incorporated therein in coupler solvents, and having antihalation layers containing metallic silver in gelatin, was to employ a silver sulfide system. However, silver sulfide sound images are not as satisfactory

as silver sound images, and require exposure from a positive, which is a disadvantage. The present invention thus provides a convenient method for retaining silver in the sound track portion of the film and provides a metallic silver sound image, which may be obtained from a negative sound original, this being more convenient than exposing from a positive sound original.

The process of the invention is generally applicable to the production of sound track images in color films of the type having incorporated couplers dispersed in coupler solvent. That is, the invention provides advantages even when the film does not contain silver filter layers. The special treatment of the invention, in one application to the sound image area of the film, serves to retain the silver therein even during removal of silver from the picture image area of the film.

My invention will be further illustrated by the following example.

A color film of the type described in U.S. Patent 2,533,514 and including a sound track was exposed in the sound and picture areas, developed in a black-and-white developer comprising N-methyl-para-aminophenol sulfate and hydroquinone and a portion of the film representing the sound track was then passed, after washing, through the following solution:

Water	ml	300
Ethylene maleic anhydride copolymer amide ammonium salt	grams	10
Hexylene glycol	ml	10
Ammonium thiosulfate (60% by weight)	ml	550
Hexadecyl trimethyl ammonium bromide	grams	5
Water to make	liter	1

The film was then hardened and stopped, exposed to a white-light reversal exposure, color developed, bleached, fixed and stabilized in the usual manner. The silver sound image of the sound track remained substantially unaffected by the subsequent bleaching and processing operations.

In accordance with my invention, any alkyl or aryl substituted quaternary ammonium compound may be employed to contact the sound area of the film prior to reversal exposure and color development. The following quaternary ammonium compounds may be employed in accordance with the invention:



wherein R_1, R_2, R_3 and R_4 each are selected from the group consisting of alkyl radicals having from 1–24 carbon atoms and aryl substituents, such as tolyl or phenyl, and Z is an acid anion such as halide, sulfate or phosphate, etc. The alkyl radicals may be, for example, methyl, butyl, octyl, undecyl, pentadecyl, eicosyl or tricosyl. Preferably, we employ a tetraalkyl ammonium halide wherein at least one of the alkyl groups is a straight chain radical composed of carbon and hydrogen containing from 12–18 carbon atoms. Typical quaternary ammonium compounds which are used in accordance with the invention include dodecyl trimethyl ammonium chloride, trimethyl phenyl ammonium chloride, octadecyl trimethyl ammonium chloride, tetrahexyl ammonium iodide and the like. Dodecyltrimethyl ammonium sulfate and dodecyltrimethyl ammonium phosphate may also be employed.

In a prefered embodiment of my invention, a fixing agent, preferably ammonium hypo or sodium hypo is incorporated together with the quaternary amomnium compound in a solution to treat the sound track portion of the film. However, the inclusion of a fixing agent in the solution is not necessary.

The application of the quaternary ammonium compound to a sound track area only may be accomplished in any convenient manner such as passing the edge of the film bearing the sound image through a bath containing the quaternary ammonium compound, or by passing the sound area of the film under a roller which is wet with a solution containing the quaternary ammonium salt. The length of time that the sound track portion of the film is contacted with the processing solution may be varied considerably, and depends to some extent on the concentration of quaternary ammonium compound in the processing bath or solution. Especially good results are obtained with contact times of 5 to 10 seconds in baths containing 2–10 grams per liter of solution of quaternary ammonium salt. The contact time and concentration should be adjusted as desired to retain the sound image silver. Aqueous solutions are preferred, but any solvent inert with respect to the sound track portion of the film and the quaternary ammonium salt may be employed.

The process of my invention is useful in the development of silver image sound tracks in color films of the type having emulsion layers containing color couplers dispersed in a nonvolatile solvent or a resin. Among the solvents and resins which are employed with satisfactory results are tricresyl phosphate, triphenyl phosphate, butylphthalate, hexylbenzoate, terpene maleic anhydride resins and the like. A number of typical coupler solvents commonly employed are disclosed in U.S. Patent 2,322,027, pages 2 and 3.

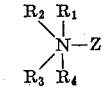
As noted heretofore, in accordance with my invention, the sound image area of the multicolor film containing incorporated coupler dissolved in a suitable coupler solvent is contacted with a quaternary ammonium compound at any point after the initial development and prior to white-light reversal exposure and color development. Preferably, the treatment is effected in the next processing step after initial black-and-white development.

The subject invention provides a highly convient method for retaining the silver image in the sound track area of multicolor film. It requires but one treatment of the sound image portion only, and allows obtaining a metallic silver sound track in a color reversal film from a negative sound original.

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

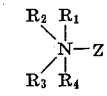
I claim:

1. In the development of a multicolor film having a silver sound image area and having incorporated in the emulsion layer a dispersion of color coupler dissolved in coupler solvent, the improvement which comprises contacting the sound track area of the film subsequent to initial black-and-white development, and prior to color development, with a quaternary ammonium compound having the formula:



wherein R_1, R_2, R_3 and R_4 each are selected from the group consisting of alkyl and aryl substituents, and Z is an acid anion.

2. In the development of a multicolor film having color couplers dispersed therein, which couplers are dissolved in a coupler solvent, and which film carries a latent image sound track, the improvement which comprises contacting said silver image sound track, subsequent to black-and-white development and prior to color development, with a compound having the following formula:



wherein R_1, R_2, R_3 and R_4 each are selected from the group consisting of alkyl and aryl substituents, and Z is an acid anion; and a fixing agent.

3. The process of claim 2 wherein the quaternary ammonium compound has at least one straight chain alkyl substituent of 12–18 carbon atoms, and is an halide salt.

4. Claim 2 wherein the fixing agent is selected from the group consisting of sodium thiosulfate and ammonium thiosulfate.

No references cited.

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