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COLOR PHOTOGRAPHY

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10 Claims. (Cl. 95—6)

The present invention relates to color photography and more particularly to a process of color forming development. In the known color forming development processes a multilayer film is used, in which the differently sensitized silver halide emulsion layers contain diffusion-fast color formers. By exposing the film and developing the same with suitable developers, colored photographic pictures are obtained. At the exposed places dye-stuffs are formed from the dye-stuff components or color formers together with the developed silver, whereas at the places which have not been exposed to light, the colorless diffusion fast dye-stuff components remain unchanged and do not influence the picture.

It is often desirable to chemically alter the dye-stuff pictures in some way or another by an after-treatment in order to increase for instance the fastness to light of the dyes or their capacity for light absorption or in order to obtain a subsequent change of the color shades by bonding thereto another dye. For the purpose of sound films it is sometimes important to be able to increase the capacity of absorption of the dyes for the infra-red region of the spectrum. For this purpose dye-stuff components have been proposed which contain reactive groups which can later be reacted with other compounds. The employment of such dye-stuff components or color formers presents the difficulty that in a multi-color picture the dye-stuff components remaining unchanged in the layers apart from the dye-stuffs enter into a reaction, thus causing undesirable alteration.

It is an object of this invention to provide a process of developing photographic multi-layer materials, in which the above described disadvantages are avoided.

A further object of the invention consists in the provision of color photographic pictures obtained by color-forming development, which are capable of being modified by chemical after-treatment.

A further object of the invention is the provision of a color-forming developer containing a developing agent having in its molecule groups capable of being further reacted.

Still further objects of the invention will be apparent from the following detailed specification.

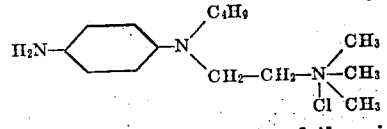
We have found that the above described objects are accomplished and the subsequent conversion can be limited to the already formed picture-dyes in the finished picture, while excluding from the after-treatment reaction the excess dye-stuff components remaining in the white parts of the picture, by employing color-forming substances, containing in their molecule groups, which are capable of being further reacted, for instance quaternary nitrogen atoms. Groups of this kind may easily be reacted with acid dyes or organic, inorganic or complex acids. The developing substances containing such groups must of course be easily soluble. They react only at the exposed places with the color former, so that the reactive group in the finished picture is only present at those places, where the picture dyes are and where they are only desired.

The process of the invention is applicable generally in color forming development and is especially useful in the production of photographic pictures from silver halide emulsion layers containing dye-stuff components fast to diffusion, such as described in the U. S. Patents Nos. 2,178,612, 2,179,238, 2,179,239, 2,179,244, 2,186,849 and the like, assigned to applicants' present assignee.

The invention is illustrated by the following examples.

Example 1

A multilayer photographic material containing diffusion-fast color formers is developed after exposure with p-aminophenylbutylaminoethyltrimethylammoniumchloride of the formula



For correcting the color shade of the picture it can be aftertreated according to the desired change with a yellow, purple, blue-green, blue, red or green acid dye-stuff.

Example 2

A multi-color picture obtained in a multi-layer photographic element by developing with a developer described in Example 1 is after-treated in order to increase the fastness to light thereof with colorless or practically colorless complex acids, such as for instance phospho-molybdic

acid, phospho-tungstic acid or a similar complex acid of a metal as will be readily apparent to those skilled in the art.

Example 3

A multi-color picture obtained in a multi-layer element by developing with a developer of Example 1, which multi-colored picture contains a sound track is after-treated for the purpose of increasing the infra-red absorption of the sound track with an acid having the effect of increasing the infra-red absorption, for instance the complex metal acids enumerated in Example 2 or with infra-red absorbing dyes.

We claim:

1. A process of developing silver halide emulsions containing color-formers fast to diffusion which process comprises developing said emulsions with a developer containing p-aminophenylbutylaminoethyltrimethylammoniumchloride.

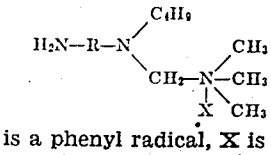
2. A color-forming developer comprising as a developing agent p-aminophenylbutylaminoethyltrimethylammoniumchloride.

3. A process of developing silver halide emulsions containing color formers fast to diffusion which comprises developing said emulsions with a developer containing p-aminophenylbutylaminoethyl-trimethylammonium chloride and treating the dyestuff image thus obtained with an acid compound capable of reacting with said trimethylammonium radical to form a modified dyestuff.

4. A process of developing silver halide emulsions containing color formers fast to diffusion which comprises developing said emulsions with a developer containing p-aminophenylbutylaminoethyl - trimethylammoniumchloride and treating the dyestuff image thus obtained with a compound selected from the group consisting of an acid dye and a complex metal-containing acid.

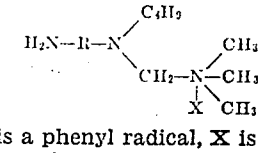
5. A process of developing silver halide emulsions containing color formers fast to diffusion which comprises developing said emulsions with a developer containing p-aminophenylbutylaminoethyl - trimethylammoniumchloride and treating the dyestuff image thus obtained with phospho-molybdic acid.

6. A color-forming developer comprising as a developing agent a compound of the following formula:



wherein R is a phenyl radical, X is halogen, and wherein the amino groups stand in the 1- and 4-positions of the phenyl radical.

7. A process of developing silver halide emulsions containing color-formers fast to diffusion which comprises developing said emulsions with a developer containing as a developing agent a compound of the following formula:



wherein R is a phenyl radical, X is halogen, and wherein the amino groups stand in the 1- and 4-positions of the phenyl radical.

8. A process of developing silver halide emulsions containing color formers fast to diffusion which comprises developing exposed picture and sound areas of said emulsions with a developer containing p-amino phenyl-butyl-amino-ethyl-trimethylammoniumchloride and treating the dyestuff image thus obtained in the sound track area with an acid compound capable of reacting with said trimethyl ammonium radical to increase the absorption of the sound track area to infrared.

9. The process as defined in claim 8 wherein said acid compound is selected from the class consisting of an acid dye and a complex metal-containing acid.

10. The process as defined in claim 8 wherein said acid compound is phospho-molybdic acid.

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