

UNITED STATES PATENT OFFICE

2,039,730

COLOR-FORMING DEVELOPER

Leopold D. Mannes and Leopold Godowsky, Jr.,
Rochester, N. Y., assignors to Eastman Kodak
Company, Rochester, N. Y., a corporation of
New York

No Drawing. Application February 27, 1935,
Serial No. 8,520

8 Claims. (Cl. 95—88)

This invention relates to dyes and more particularly to dyes formed by coupling during photographic development.

It is known that colored photographic images may be formed by using a developer which forms a colored compound on development. The colored compound thus formed is deposited adjacent the silver image during the development. It is also known that a colored image may be formed by adding to the developer solution a compound which combines with the oxidation product of the developer and forms a coloring substance.

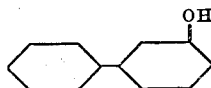
It is an object of the present invention to provide a developer which produces a dye simultaneously and in situ with photographic development. It is a further object to produce novel dyes in color-forming photographic development.

These and other objects are accomplished by the present invention by the use of aromatic amino developers together with certain specific coloring compounds hereinafter disclosed.

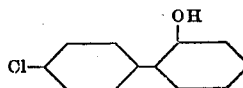
When a silver halide emulsion containing a latent photographic image is developed, the silver halide is reduced to metallic silver and the developing agent is oxidized. The aromatic diamino compounds which have been used as developers form on oxidation products which will react with coupling compounds to form dyes. If such coupling compounds are added to the developer solution, or incorporated in the emulsion layer, a dye is formed by the coupling of this compound with the oxidation product of the aromatic diamino compound and is deposited in the gelatin or other silver halide carrier adjacent to the metallic silver grain. The dyes thus formed do not readily wander from the place of formation. They may be soluble or insoluble in water, but the water-insoluble dyes are preferably used. They are not physically attached to the silver grain so that the silver may be subsequently bleached out of the carrier layer leaving a pure dye image.

We have found that compounds of the hydroxy diphenyl class form suitable coupling agents when used with aromatic amino developers. Compounds of this class are meta or ortho-hydroxy diphenyl and their substituted derivatives. Substituent groups include halide, nitro, amino, substituted amino, alkyl, aryl, and carboxyl. These groups may be substituted on either ring at any position except in most cases the position para with respect to the hydroxyl group. These compounds form, in general, blue or blue-green dyes by combining with the oxidation product of the aromatic amino developer during development of the image. Specific compounds of this group which we contemplate using are meta or ortho-hydroxy diphenyl, 2-chloro ortho phenyl phenol, 4-chloro ortho-phenyl phenol 2-methyl ortho phenyl phenol and 4-amino diethyl ortho phenyl

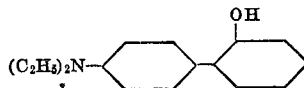
phenol. The formula for meta-hydroxy diphenyl may be represented as follows:



The formula for 4-chloro ortho phenyl phenol is,



The formula for 4-amino diethyl ortho phenyl phenol is,



The aromatic amino compounds which may be used as developers in our process include the mono-, di-, and tri-amino aryl compounds. The developers usually used are the diamino compounds such as para-phenylenediamine and its substitution products. These developers may be substituted in the amino groups as well as in the ring, forming compounds such as the alkyl-phenylenediamines and alkyl toluylenediamines. These compounds are usually used in the salt form such as hydrochloride or sulfate since these are more stable than the amines themselves. As examples of developers of this class, there may be mentioned diethyl para-phenylenediamine hydrochloride, mono-methyl para-phenylenediamine hydrochloride and diethyl para-phenylenediamine sulfate.

The following developer solutions may be used to give a colored image according to our process:

Formula I

A. Dimethyl p. phenylenediamine HCl.....	2 g.	40
Sodium sulfite.....	5 g.	
Sodium carbonate.....	30 g.	
Water to.....	1000 cc.	
B. 2-chloro ortho phenyl phenol.....	2 g.	
Acetone.....	100 cc.	45

Add B to A

Formula II

A. Diethyl p. phenylenediamine HCl....	3 g.	
Sodium sulfite.....	5 g.	50
Sodium carbonate.....	50 g.	
Water to.....	1000 cc.	
B. m-hydroxy diphenyl.....	2.5 g.	
Methyl alcohol.....	100 cc.	55

Add B to A

Other solvents, particularly alcohol, may be used in bath B.

Our process may be used to form colored photographic images in plates or papers as well as in films and the dyes will be formed when gelatin

or other carrier for the silver halide is used. The emulsion treated may be on one side or both sides of a film support and may be in one layer or a plurality of differently sensitized layers. The dyes formed may be decolorized by an oxidizing agent such as chromic acid and colorless soluble compounds thereby formed. The bleaching of the dye in this manner does not destroy the silver image and a silver image thus treated may be colored, bleached and recolored a number of times. Such a process is disclosed in our application, Serial No. 8,516, filed February 27, 1935.

What we claim is:

1. A color-forming photographic developer comprising an aromatic amino compound and a coupler compound of the hydroxy diphenyl class.

2. A color-forming photographic developer comprising an aromatic amino compound and a substituted ortho hydroxy diphenyl.

3. A color-forming photographic developer

comprising an aromatic amino compound and 2-chloro ortho phenyl phenol.

4. A color-forming photographic developer comprising an aromatic amino compound and ortho hydroxy diphenyl.

5. A color-forming photographic developer comprising an aromatic amino compound and 4-chloro ortho phenyl phenol.

6. A color-forming photographic developer comprising a paraphenylene diamine and a coupler compound of the hydroxy diphenyl class.

7. A color-forming photographic developer comprising a paraphenylene diamine and ortho hydroxy diphenyl.

8. A color-forming photographic developer comprising diethyl paraphenylene diamine and a coupler compound of the hydroxy diphenyl class.

LEOPOLD D. MANNES.

LEOPOLD GODOWSKY, JR.