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DEVELOPER CONTAINING SULPHONAMIDE GROUPS

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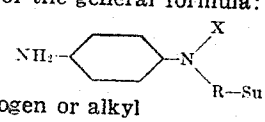
10 Claims. (Cl. 95—88)

This invention relates to photographic developers and more particularly to photographic developers containing sulphonamide groups.

It is known that photographic developers of the p-phenylene diamine type are valuable compounds for producing fine grain black and white photographic images and also that these compounds, especially when they contain alkyl substituents, are useful as developers in processes for producing colored photographic images. The p-phenylene diamine developers, however, have several defects. One disadvantage of these developers is that they are not greatly soluble in the developing solutions. Another disadvantage is that they are highly allergenic, that is, they are poisonous to the human skin and are, therefore, somewhat dangerous to use. When the p-phenylenediamines are used in color development processes, it has also been found that they do not always produce the desired color in the final image.

It is, therefore, the principal object of the present invention to provide an entirely new class of photographic developing agents of the p-phenylenediamine type. A further object is to provide photographic developing agents which are more soluble in the developing solutions than compounds previously used. A still further object is to provide developing agents which are less allergenic, that is, less poisonous to the human skin than compounds hitherto known. A still further object is to provide photographic developing agents of the substituted p-phenylene-diamine type which are useful in photographic color processes for the purpose of producing images of the desired color.

These objects are accomplished by the present invention by the use, as developing agents, of compounds of the general formula:



where

X is hydrogen or alkyl

R is alkylene

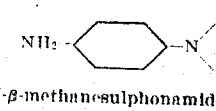
Su is $-SO_2NH_2$

$-SO_2NHR'$

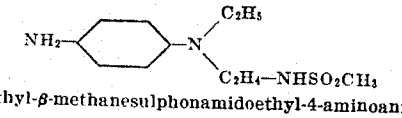
$-NHSO_2R'$

R' is hydrogen or alkyl.

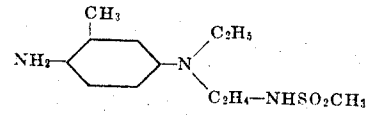
Specific compounds which I contemplate using are as follows:



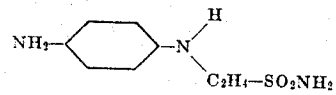
N-β-methanesulphonamidoethyl-4-aminoaniline



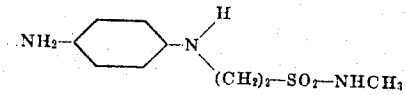
N-ethyl-β-methanesulphonamidoethyl-4-aminoaniline



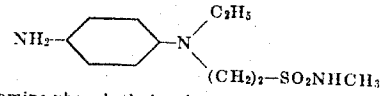
N-ethyl-β-methanesulphonamidoethyl-3-methyl-4-aminoaniline



N-β-sulphonamidoethyl-4-aminoaniline



N-β-p-aminophenylamino ethane sulphon-methylamide



N-β-p-amino phenyl ethyl aminoethanesulphon-methyl-amide

These compounds may be formed by the reaction of primary amines with alkyl or substituted alkyl sulphonyl chlorides for example, methane sulphonyl chloride, or through other intermediates or by the reaction of primary amines with chlorides or other derivatives of half esters of sulphuric acid. The solubilizing and other beneficial properties are secured by the $-SO_2NH_2$, or $-NHSO_2-$ group, which may contain alkyl substituents as indicated in the general formula above. The aryl nucleus of the developer may be attached to either side of this solubilizing group as indicated by the specific examples.

These compounds may be substituted in the aromatic ring with other groups including halide, amino, substituted amino, azo, alkyl and aryl groups. These groups have a tendency to alter the color of the final dye image and the color may be controlled in this way.

When used for the formation of colored photographic images, the developers of my invention may be used in conjunction with any well known coupler compounds such as those described in Fischer U. S. Patent 1,102,028, June 30, 1914; Mannes & Godowsky U. S. Patent 2,108,602, February 15, 1938; Mannes, Godowsky and Peterson U. S. Patent 2,115,394, April 26, 1938; and Mannes, Godowsky and Peterson U. S. Patent 2,126,337, August 9, 1938.

The following examples, which are illustrative only, indicate developing solutions which may be used according to my invention.

Example 1

A. N-ethyl-β-methanesulphonamidoethyl-4-aminoaniline	gram	1
Sodium sulphite	do	0.5
Sodium carbonate	do	20
Water to	cc	1000
B. Coupler	gram	1
Acetone	cc	50

Add B to A.

Example 2

The coupler used to form a colored image may be incorporated in the emulsion layer prior to exposure and a colored image formed by development in the following solution:

N-ethyl-β-methanesulphonamidoethyl-3-methyl-4-aminoaniline	grams	2
Sodium sulphite	do	0.5
Sodium carbonate	do	30
Water to	cc	1000

Example 3

For the formation of a fine-grain black and white image, the following developing solution may be used:

N-β-methanesulphonamidoethyl-4-aminoaniline	grams	5
Sodium sulphite	do	30
Sodium carbonate	do	30
Water to	cc	1000

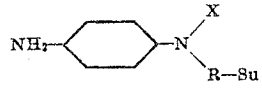
All of the developers described in the present application may be used for the purpose of producing fine grain, black and white photographic images. Although all of these developers may be used also to form colored images in conjunction with suitable color forming coupler compounds, the developers in which the substituted nitrogen atom of the p-phenylenediamine contains an alkyl group in addition to the sulphonamido alkyl group have been found to be superior as color developers. These developers are those in which X in the general formula above is an alkyl group.

The developing agents described in the present application may be used to form photographic images by development of exposed silver halide contained in the usual gelatin carrier or in carriers such as collodion, water permeable cellulose esters, or water permeable synthetic resins. The sensitive layers may be carried on any suitable support such as glass, paper, cellulose esters or synthetic resins. They may be used with multilayer films where two or more layers are coated on the same side of a support or where the layers are coated on the opposite sides of a support.

The examples and formulae of the present specification are illustrative only and it is to be understood that my invention is to be taken only as limited by the scope of the appended claims.

I claim:

1. A photographic developing agent having the following general formula:



wherein

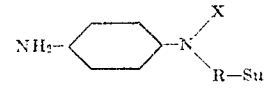
X is hydrogen
alkyl
R is alkylene
Su is —SO_2NH_2
—SO_2NHR'
—$NHSO_2R'$
R' is hydrogen
alkyl

2. A photographic developing agent comprising a p-phenylenediamine containing a sulphonamidoalkyl substituent on one of the nitrogen atoms.

3. A photographic developing agent comprising a nitrogen substituted sulphonamidoalkyl-4-aminoaniline.

4. A photographic developing agent comprising a N-β-sulphonamidoalkyl-4-aminoaniline.

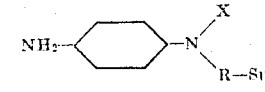
5. A color forming photographic developer comprising compound having the general formula:



where

X is alkyl
R is alkylene
Su is —SO_2NH_2
—SO_2NHR'
—$NHSO_2R'$
R' is hydrogen
alkyl

6. A photographic developing solution for producing a colored image comprising a developing agent having the general formula:



where

X is alkyl
R is alkylene
Su is —SO_2NH_2
—SO_2NHR'
—$NHSO_2R'$
R' is hydrogen
alkyl

and a compound which is coupled with the developing agent at the primary amino group on photographic development to form a colored image.

7. A color forming photographic developer comprising an N-alkyl-methanesulphonamidoalkyl-4-aminoaniline.

8. A developing solution for producing a colored photographic image comprising an N-alkyl-methanesulphonamidoalkyl-4-aminoaniline and a compound which couples with the developing agent at the primary amino group to form a colored image on development.

9. A color forming photographic developer N-ethyl-β-methanesulphonamidoethyl-4-aminoaniline.

10. A developing solution for producing a colored image comprising N-ethyl-β-methanesulphonamidoethyl-4-aminoaniline as a developing agent and a compound which couples with the developing agent at the primary amino group to produce a colored image on photographic development.

ARNOLD WEISSBERGER.