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PHOTOGRAPHIC FILM DEVELOPER

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1 Claim. (Cl. 96—66)

This invention relates to an improved photographic developer and in particular to a photographic developer having very high energy development and fine grain characteristics.

When photographing physical phenomena which occur in a short time period, a better record may be obtained if a high energy developer is used for developing the photographic record, as very often the light falling on the film is insufficient to produce an image when developed by ordinary low energy developer. However, most cameras for this purpose reduce the observed phenomena to a very small image on the film because of limitations in the optical system. Therefore, there is considerable advantage in having a developer which not only has the high energy quality but which also produces a fine grain image which may subsequently be enlarged with retention of fine detail.

The developers of the prior art have been either of one characteristic or the other; that is, a high energy developer which produces a coarse grain image or a fine grain developer which does not have a high energy characteristic.

By this invention a photographic developer has been produced which contains both of the features of a fine grain development and high energy development. This has been achieved by the use of aminoacetic acid in photographic developers.

It is, therefore, an object of this invention to formulate a developer having the combined characteristics of a high energy developer and a fine grain developer.

Another object of this invention is to formulate an additive which may be added to other developers to give them fine grain and high energy development characteristics.

Further objects of this invention will be shown in the following specification and claim.

In the preferred embodiment, the formula of the developer of this invention is as follows:

	Grams
Sodium sulfite (anhydrous)	100
Hydroquinone	10
Aminoacetic acid (CH_2NH_2COOH)	10
1-phenyl-3-pyrazolidone [1]	0.4
Sodium borate	3
Boric acid	3.5
Potassium bromide	1
Water to make 1 liter	

[1] Known in the art also as Phenidone.

The developer, when mixed according to the formula shown above, has a higher threshold energy development than D–19, a very high energy developer, and finer grain characteristics than D–76, the generally accepted standard among fine grain developers. (Formulas for D–19 and D–76 are listed respectively on pages 6—14 and 6—67 of the Photo Lab Index, 8th edition.)

Though 10 grams of aminoacetic acid per liter of developer is the preferred proportion, it has been found that from 2 grams to 50 grams of aminoacetic acid may be added with good results. The aminoacetic acid may be added to the dry chemicals used to prepare the developer solution or may be added to the developer solution.

Another advantage of the developer of this invention is that the pH is quite low, namely 8.54. It has been found that the higher pH developers tend to generate a high background fog and greater granularity on the film being developed, due to gaseous disturbances on the film surface during the development. Consequently, the background fogging or density on film developed and the granularity in the formula of this invention is very low with no sacrifice in threshold speed.

Further, the lower granularity of the developed film when developed according to this invention, as compared to the prior art, is probably aided by a slower induction period of the developer of this invention. This is due to the presence of aminoacetic acid in the developer.

This developer has been used on many of the new films commercially available and has been found superior to other developers available. Full-rated film speed is realized in all cases and the granularity, though related to the emulsion type, is finer than generally achieved for comparative developments with other developers.

Although the developer of this invention has been shown to have a decided advantage when used with high-speed photography, its use is by no means limited to this field. Its value in the ordinary snapshot photography or for ordinary movies is readily apparent, as it has been found that for these purposes also the developer is superior to those shown in the prior art.

It has been further found that many of the developers of the prior art may be improved by adding one of the constituents of the developers of this invention, namely aminoacetic acid. Although the results are generally not as good as those achieved from the formula cited above, the improvement to the developers of the prior art is sufficiently great to make the addition of aminoacetic acid well worthwhile. The best results of adding aminoacetic acid to a developer are realized when the developer contains potassium bromide and is of the p-methylaminophenol sulphate (metol) hydroquinone complex or of the 1-phenyl-3-pyrazolidone-hydroquinone complex developers. However, its use for other developers is also of importance.

The time of development varies from 5 to 15 minutes, according to the film used, and the conditions under which the film is exposed. The exact time required for any particular film can readily be determined by those skilled in the art. However, it is suggested that for most panchromatic films, for maximum speed and optimum develop-

ment, these films should be developed at 68° F. for 15 minutes.

The shelf life of this developer is excellent and it may be stored for long periods (more than 3 months) at the usual ambient temperatures.

The working life of the developer of this invention is unusually good. For example, as many as 6000 square inches of film have been developed in ½ gallon of developer with sufficient additions of fresh developer to keep the level constant.

Films have been developed with the developer of this invention at a temperature as high as 85° F., which is the upper safe temperature limit for normal films and bath type developers.

This invention is not limited to photographic emulsions on bases defined as "films" because it is also useful for other photographic emulsions on other bases, as is readily apparent to those skilled in the art. It is only limited by the appended claim.

What is claimed is:

A photographic developer consisting of about the following composition:

	Grams
Sodium sulfite (anhydrous)	100
Hydroquinone	10
Aminoacetic acid (CH_2NH_2COOH)	10
1-phenyl-3-pyrazolidone	0.4
Sodium borate	3
Boric acid	3.5
Potassium bromide	1
Water to make 1 liter	

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