

[54] **PHOTOGRAPHIC DEVELOPER**
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[58] **Field of Search**..... **96/66 HD**

[56] **References Cited**
FOREIGN PATENTS OR APPLICATIONS
761,301 11/1956 Great Britain 96/66 HD

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[57] **ABSTRACT**

A photographic developer for achieving maximum film sensitivity by increasing the dynamic range of a photographic film which includes an additive mixture of N-(p-hydroxyphenyl glycin) and 1-phenyl-3-pyrazolidone.

1 Claim, No Drawings

PHOTOGRAPHIC DEVELOPER

BACKGROUND OF THE INVENTION

This invention relates to photography and, more particularly, to a novel photographic developing agent.

The problem of obtaining maximum film sensitivity has been of great concern to the photographic industry. Numerous approaches have been explored in attempting to solve this problem. For example, one method for obtaining high sensitivity involves "forced" development. In other words, a prolonged development to the point where the resulting high fog level becomes unacceptable. Generally, forced development results not only in maximum sensitivity for the film-developer combination concerned, but also maximum gamma. Because of the high film densities after produced, data reduction is difficult and in regions of high and over-exposure, resolution is reduced. Therefore, a developer which combines extended dynamic range (low gamma), good resolution at high and over-exposed levels with high film sensitivity could be relied upon to overcome the problems encountered with forced development.

A phenidone-sodium sulfite developer with great dynamic range and no loss of film sensitivity for the films tested was formulated. However, the gammas obtained (0.12-0.25) for normal contrast films were low for many purposes, and in the case of Kodak Royal-X Pan Sheet film, a density range of only 0.2 was obtained with 10 minutes development at 68°F. Therefore, this prior art developer did not completely overcome the problems of prolonged development.

With the present invention, however, the disadvantages resulting from the use of forced development or the previously known phenidone-sodium sulfite developers have been overcome by using an additive mixture of glycine and phenidone as a developing agent.

The developer of this invention increases the dynamic range of most films. It produces gammas in the 0.3-0.5 range for normal contrast films at practicable developing times. There is no significant loss, and in most cases, appreciable gain in film toe speed as compared with standard processing. Resolution in the high and over-exposed regions is improved. The developer can be used successfully in machine processing such as in the Filmline S-90 Spray processor.

SUMMARY OF THE INVENTION

In accordance with the present invention, it has been found that maximum film sensitivity for photodeveloped films can be achieved by utilizing a glycine-phenidone developing agent. The developer of this invention comprises an aqueous solution of an additive mixture of glycine and phenidone as well as sodium sulfite, sodium bisulfite and Kodalk. The developer of this invention makes possible low gamma photography with no less of toe speed during machine processing. It results in increased information in that more information can be printed on a single print because of the excellent shadow detail and the fully detailed highlights that are achieved.

Accordingly, the primary object of this invention is to provide an improved photographic developer.

Another object of this invention is to provide a photographic developing agent capable of achieving maximum film sensitivity.

Still another object of this invention is to provide a photographic developer that can increase the dynamic range of photographic films while still maintaining good resolution at high and overexposed levels as well as high film sensitivity.

The above and still other objects and advantages of the present invention will become apparent upon consideration of the following detailed description of specific embodiments thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The photographic developer of this invention comprises an additive mixture of phenidone and glycine in combination with sodium sulfite and sodium bisulfite. It increases the dynamic range of most films and produces gammas in the 0.3-0.5 range for normal contrast films and about 0.7 for high speed infrared film at practicable developing times. Glycine is a slow, powerful, fog-free developing agent, extremely resistant to aerial oxidation. It is more particularly defined as N-(p-hydroxyphenyl glycine). Phenidone is more particularly defined as 1-phenyl-3-pyrazolidone and has the advantage of a very short induction period. The two developing agents, when combined in the manner described, form a super additive mixture that is responsible for achieving the low gammas of this invention.

To further illustrate the invention, there are presented the following examples. Example 1 represents the conventional phenidone-sodium sulfite developer heretofore employed in attempting to overcome the problem encountered during forced development. Examples 2 and 3 illustrate the present invention.

EXAMPLE 1

Phenidone	1.5 g
Sodium Sulfite	30.0 g
Water	to 1 liter

The developer of Example 1 obtained gammas of 0.12-0.25 for normal contrast films and are somewhat low for many purposes. In the case of Kodak Royal-X Pan sheet film, a density range of only 0.1-0.8 was obtained with 10 minutes development at 68°F.

EXAMPLE 2

Phenidone	2.0 g
Sodium Sulfite	40.0 g
Glycine	10.0 g
Sodium Bisulfite	25.0 g
Kodalk	25.0 g
Water	to 1 liter

The developer of Example 2 produced a negative with a density range of 0.2 to 0.8 and a gamma of 0.4. In all cases the usual 3 minute pre-rinse in 2% NaHSO₃ was used. Kodalk, chemically defined as sodium metaborate, is an alkali product of Eastman Kodak Company. Further information concerning Kodalk may be found in U.S. Pat. Nos. 1,976,299 and 1,990,800.

EXAMPLE 3

Phenidone	2.0 g
Sodium Sulfite	40.0 g
Glycine	10.0 g
Sodium Bisulfite	25.0 g
Kodalk	50.0 g
Water	to 1 liter

The developer of Example 3, with a 10 minute pre-rinse in NaHSO₃, produced with 12 minutes develop-

ment at 68°F, a negative on RXP with a gamma of 0.64 and no loss of toe speed. All steps of the gray scale were visible upon visual inspection. Further tests of this formula resulted in lower gamma (0.55) with all gray scale steps visible. The higher gamma in the previous test was probably attributable to the 10 minute pre-rinse. However, it was found that for a given development time, the NaHSO₃ treatment had no effect on toe speed. It is likely that the increased gamma, if desired, can be attained more quickly by a slight increase in development time.

Tests were also made on Plus-X and 2,475 emulsions, with similar results. The gamma obtained by 12 minutes development at 68°F was 0.5. Prints from both of these films had excellent shadow detail, and fully detailed highlights. Developing times are about the same as with Kodak D-76 but the gammas are of course lower.

Machine processing such as in the S-90 Filmline spray processor has been used successfully. Development of XT-Pan is at 85°F and 40 ft./min. (slightly less than 2 min. developing time), and the gamma obtained about 0.40. To reduce oxidation due to the great developer-air surface characteristic of spray processing, the developing chamber is filled with gaseous N₂, and a small positive N₂ pressure is maintained during process-

ing. As much as 2,400 feet of 35 mm XT-Pan films has been processed in one run, using an unmodified developer of Example 3 as a replenisher.

The glycin-phenidone developer of this invention, as illustrated in Examples 2 and 3 produces somewhat higher gammas than the prior art developer of Example 1 and also increases the toe speed of most of the films tested, as compared with standard processing with Solumat developer. The dynamic range is increased by at least 10X, and resolution in regions of high and over-exposure is improved.

It will be understood that the foregoing description of this invention is presented for purposes of illustration only, and that the scope of the invention is not to be limited in any way except as defined by the appended claims.

What is claimed is:

1. A photographic developer composition comprising an aqueous solution consisting essentially of a mixture of 5 parts by weight of N-(p-hydroxyphenyl glycin), 1 part by weight of 1-phenyl-3-pyrazolidone, 20 parts by weight of sodium sulphite, 12.5 parts by weight of sodium bisulfite, 12.5 to 25 parts by weight of a sodium metaborate alkali stabilizer and sufficient water to make one liter of said aqueous solution.

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