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METHOD OF MAKING DYED RELIEF RECORDS

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In forming dyed relief records it has been proposed to develop an exposed silver-halide film and harden the gelatin in the exposed portions, usually in the same operation with a hardening developer such as pyrogallol, then etch off the unhardened gelatin in the unexposed portions to form a relief record, and then dye the relief record. If the record is to be used for direct viewing or projection the developed silver is bleached out but for use as a matrix in imbibition printing the silver need not be bleached.

While such records have many advantages, particularly for imbibition printing, heretofore they have also had certain disadvantages. Sometimes they exhibit graininess and lack of resolving power, particularly when they, or prints therefrom, are greatly magnified as in the case of wide-screen projection of motion pictures. Another difficulty is known as "breakthrough" in the highlights. That is, in the areas of gelatin corresponding to the toe portion of the H & D curve, the etch breaks all the way through or leaves the gelatin too thin to absorb appreciable dye. This difficulty is especially troublesome in the case of emulsion containing screening elements of carbon such as used in certain matrices to produce non-selective absorptivity.

Objects of the present invention are to overcome the aforesaid difficulties, to yield smooth and uniform etching in the highlights without breakthrough, and to produce dyed relief records which have great resolving power and superior quality not only in the highlight portions but throughout, particularly for use as imbibition matrices.

In one aspect the present invention involves a method of forming a dyed relief record from a film sensitized with silver-halide which comprises exposing the film to form a latent image, developing the film to form a silver image and hardening the film in the region of the developed silver, etching off the unhardened film to form a relief record, and dying the relief record, characterized by using sodium thiosulphate, or other soluble thiosulphate, in the developer to prevent the film from being etched all the way through in the highlights. Preferably the developing and hardening is effected in the same stage by using a pyrogallol developer. Any substantial amount of sodium thiosulphate is beneficial up to the region of 2% to 3% by weight, but the amount should be kept under approximately 3%. With a pyrogallol developer best results have been obtained with approximately 2%.

In another aspect the invention involves a hardening developer containing less than approximately 3% of sodium thiosulphate by weight, preferably approximately 2%, for use in forming a dyed relief record from a film sensitized with silver-halide to prevent the film from being etched all the way through in the highlights.

A typical embodiment of the invention involves printing an imbibition matrix and developing it for two minutes at 64° F. in a developer having the following composition, the numbers indicating grams:

Calgon (sodium hexameta-phosphate)	1.00
Sodium sulfite	0.60
Pyrogallol	3.00
Elon (p-methylaminophenol sulphate)	2.40
Potassium bromide	2.00
Sodium thiosulfate pentahydrate (hypo)	20.00
Sodium carbonate monohydrate	150.00
Water to one liter.	

After being thus developed the matrix should be washed for one minute in a 0.3% acetic acid solution at 64° F., and then etched for 1½ minutes in water at a temperature of approximately 140° F. to remove the unhardened gelatin. While the acetic acid concentration and temperature of the etch are not critical, the concentration of acetic acid should be at least the value indicated.

The addition of the sodium thiosulphate adds greatly to the resolving power of the matrix and the prints therefrom, and also prevents the aforesaid breakthrough in etching the matrix. The improvement is particularly noticeable in wide-screen projection where the imbibition prints are magnified to a greater degree than in the case of normal projection.

While the reasons for these marked improvements are not clearly understood, the following is thought to be at least a partial explanation of the theory of operation. The introduction of the sodium thiosulphate causes the silver-halide grains, both exposed and unexposed to diminish in size and number, the smaller ones disappearing entirely. In printing the matrix, the silver-halide grains are exposed not only in the desired areas but, owing to light diffusion, to some extent in the peripheral or penumbral region of each desired grain. While these peripheral or penumbral grains may be small they affect the degree of hardening and therefore the action of the etch water. The addition of the sodium thiosulphate to the developer is thought to dissolve these peripheral or penumbral grains more or less and therefore eliminate or at least minimize the unwanted or spurious gelatin relief which would otherwise be produced. Also it is thought that the addition of the sodium thiosulphate to the developer causes the surface layers of the exposed silver-halide grains to be dissolved, thereby exposing the internal portions of the grains to the developer action and permitting more development in areas of low density, such as are to be found in the toe region of a typical H & D curve. When the internal portions of the grains are fully developed the gelatin in the highlight portions is hardened enough to prevent breakthrough in the etching process. In any event the addition of the sodium thiosulphate greatly improves the resolving power, prevents breakthrough in etching, and makes it possible to use carbon screening elements in the matrices.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

We claim:

1. For forming a dyed relief record from a colloid layer sensitized with silver-halide, the method which comprises exposing the layer to form a latent image, developing the layer with a hardening developer to form a silver image and hardening the layer in the region of the developed silver, etching off the unhardened layer to form a relief record, and dyeing the relief record, characterized by using a soluble thiosulphate in the developer to prevent the layer from being etched all the way through in the highlights.

2. For forming a dyed relief record from a colloid layer sensitized with silver-halide, the method which comprises exposing the layer to form a latent image, developing the layer with pyrogallol developer to form a silver image hardened in the region of the developed silver, etching off the unhardened layer to form a relief record, and dyeing the relief record, characterized by using a soluble thiosulphate in the developer to prevent the layer from being etched all the way through in the highlights.

3. The method according to claim 2 further characterized in that the quantity of soluble thiosulphate is less than 3% by weight.

4. The method according to claim 2 further characterized in that the quantity of soluble thiosulphate is approximately 2% by weight.

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