United States Patent

[11] 3,607,346

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[73] Assignee **Eastman Kodak Company Rochester, N.Y.**

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[54] **LAYERS METHOD OF WET TRANSFERRING UNEXPOSED PHOTOGRAPHIC EMULSION**
8 Claims, No Drawings

[52] **U.S. Cl.** **117/34,** 96/28, 96/83
[51] **Int. Cl.** **G03c 1/90,** G03c 11/12
[50] **Field of Search** 96/28, 109, 27, 83; 117/34

[56] **References Cited**

UNITED STATES PATENTS

3,185,569	5/1965	Weber	96/109

FOREIGN PATENTS

1,062,116	3/1967	Great Britain

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ABSTRACT: A method of retaining the sensitomeric properties of photographic silver halide emulsion layers which have been transferred from one support to another via an aqueous bath. Said method comprises suspending a stripped emulsion layer in an aqueous bath comprising a saccharide at a concentration of about 1 to 200 grams per liter, positioning a support beneath and contiguous to said layer, and removing said support bearing the emulsion layer from the bath.

LAYERS METHOD OF WET TRANSFERRING UNEXPOSED PHOTOGRAPHIC EMULSION

This invention relates to a method of transferring layers of a photographic emulsion to another support. In one specific aspect, this invention relates to an improved method of wet-transferring autoradiographic photographic silver halide emulsion layers to an irregular surface.

It is known that in wet-transferring methods conducted in water, the loss of soluble halide from the silver halide emulsion results in an increase in sensitivity and a growth of fog. It is also known that fog growth can be inhibited by the addition of a soluble bromide salt to the transfer water. However, the use of bromide salts has, in some instances, produced reduced sensitivity, increased fog after extended exposures, etc.

An improved method of wet-transferring a photographic emulsion layer is desired without substantially increasing fog or affecting the other photographic properties of the emulsion.

We have now found an improved method of wet-transferring photographic silver halide emulsion layers which generally comprises utilizing a saccharide in the aqueous transfer solution.

In one embodiment, said method for transferring a photographic silver halide emulsion layer comprises suspending said emulsion layer in an aqueous bath, positioning a support in contiguous relationship with said emulsion layer and removing said support with said emulsion layer simultaneously from said aqueous bath containing a saccharide at a concentration of at least about 1 gram per liter.

In another embodiment, said saccharide is glucose.

In a preferred embodiment, said aqueous bath comprises a saccharide at a concentration from about 1 to about 200 grams per liter and a soluble bromide salt at a concentration from about 1 to about 100 mg. per liter.

In another embodiment, this invention provides a very good method for transferring a photographic emulsion layer to an uneven surface without substantial reduction in some of the desired photographic properties.

The practice of the invention as herein disclosed results in autoradiographs with improved photographic characteristics.

Typical saccharides which can be used in the practice of this invention include mono- or di-saccharides such as, for example, glucose, dextrose, sucrose, fructose, galactose, maltose, levulose, lactose and the like, though glucose and sucrose are preferred. A saccharide concentration of at least about 1 gram per liter and generally in the range from about 1 to about 200 grams per liter is useful. A saccharide concentration from about 5 to about 100 grams per liter is preferred.

In emulsion layers containing a significant excess of free bromide ions, the aqueous transfer bath can comprise a saccharide alone. The transfer time (i.e., interval of time during which the emulsion layer is suspended in the aqueous bath) can then be adjusted so that the concentration of bromide left in the emulsion layer has decreased to the desired level when the emulsion is removed from the bath on the support. The length of the transfer time can be determined experimentally by evaluating the relationship between sensitivity and transfer time.

A preferred method is to add a soluble bromide salt to the aqueous bath comprising a saccharide and suspending the emulsion layer in the bath for a transfer time of about 5 minutes. Generally the soluble bromide salt can be added at a rate from about 1 to about 100 milligrams per liter, preferably from about 3 to about 30 milligrams per liter.

The practice of the invention as herein disclosed is a useful method for coating or transferring any photographic silver halide emulsion layer onto a suitable support. Examples of suitable supports include cellulose nitrate film, cellulose ester film, polyvinyl acetal film, polystyrene film, poly(ethylene terephthalate) film and related films or resinous materials as well as glass, metal and the like. Supports such as paper which are coated with α-olefin polymers, particularly polymers of α-olefins containing two or more carbon atoms, e.g.

polyethylene, polypropylene and ethylene butene copolymers, can also be employed. The practice of the invention is particularly suitable for transferring photographic silver halide emulsions uniformly onto supports which have nonflat or uneven surfaces. Examples of uneven-surfaced supports are those commonly used in autoradiography such as glass plates or slides bearing a specimen (e.g., a radioactive tissue section).

The improved method of this invention can comprise the use of a dry-stripped emulsion layer which is stripped or peeled from its temporary support, such as a glass plate, and suspended in the aqueous bath for about 5 minutes or until said layer has swelled and stretched out tight and flat. An uneven-surfaced support placed in contiguous relationship with said emulsion layer and preferably beneath said layer is removed simultaneously with said layer from the aqueous bath at a slight angle to allow excess water to drain from between said layer and said support. After drying at ambient-room temperatures or in a stream of cold air, said emulsion layer adheres to the contours of the uneven-surfaced support. The emulsion layer can then be exposed in a light, tight box. In autoradiography, lengthy exposure times of from a few days to many weeks are common.

This invention is further illustrated by the following example.

EXAMPLE

Photographic silver halide emulsion layers are stripped from fine-grain autoradiographic stripping plates of the type disclosed in *Data Book of Applied Photography, Autoradiography*, Vol. 2, SC10, and suspended for 5 minutes in different aqueous baths comprising glucose and/or potassium bromide at concentrations as disclosed in Tables 1 and 2 below. The emulsion layers are removed from the aqueous baths on glass plates and dried. Some plates are contacted or exposed to low activity sources prepared with radioactive silver 110. Other plates are stored at ambient-room temperature and humidity. All plates are developed for 5 minutes in Kodak (TM) Developer D19 at 20° C. Fog rise in unexposed plates held for 4, 12 and 24 weeks is determined by counts of fog grains as set forth in Table 1. In Table 2 the densities of plates exposed to a low activity source for 1, 12 and 24 weeks are given.

TABLE 1
Fog grains per 100n²

Sample No.	Transfer bath	Fresh	4 wks.	12 wks.	24 wks.
1	Water (control)	<1	6	10	20
2	KBr, 10 mg./l.	<1	1	5	13
3	KBr, 20 mg./l.	<1	<1	1	9
4	KBr, 40 mg./l.	<1	<1	1	1
5	KBr, 80 mg./l.	<1	<1	1	1
6	Glucose, 50 g./l. with KBr, 10 mg./l.	<1	<1	<1	1

TABLE 2
Density on exposure to a low activity source

Sample No.	Transfer bath	1 wk.	12 wks.	24 wks.
1	Water (control)	1.05	0.76	1.79
2	KBr, 10 mg./l.	1.10	0.67	1.09
3	KBr, 20 mg./l.	0.98	0.38	1.16
4	KBr, 40 mg./l.	0.97	0.51	0.54
5	KBr, 80 mg./l.	0.89	0.34	0.48
6	Glucose 50 g./l. with KBr, 10 mg./l.	0.88	0.71	1.65

The fog level of samples transferred in the aqueous bath of glucose is lowered without serious loss of density (i.e., sensitivity) when said samples are compared with either the control samples or samples containing KBr alone.

Sucrose can be used to replace glucose in the above method with similar results but is preferably used at lower relative concentrations than those of glucose.

Although the invention has been described in considerable detail with particular reference to certain preferred embodiments thereof, variations and modifications can be effected within the spirit and scope of the invention.

We claim:

1. In a method for transferring an unexposed photographic silver halide emulsion layer comprising suspending said layer in an aqueous bath, positioning a support in contiguous relationship with said layer and removing said emulsion layer on said support simultaneously from said aqueous bath, an improvement comprising a saccharide concentration in said aqueous bath of from at least about 1 gram to about 200 grams per liter.

2. The improvement of claim 1 wherein said saccharide is glucose.

3. The improvement of claim 1 wherein said saccharide is sucrose.

4. The improvement of claim 1 wherein said aqueous bath comprises a saccharide concentration in said aqueous bath of at least about 1 gram to about 200 grams per liter and a soluble bromide salt concentration from about 1 to about 100 mg. per liter.

5. The method of claim 1 wherein said support is beneath said emulsion layer upon said simultaneous removal of both from said aqueous bath.

6. The method of claim 1 wherein said support comprises an uneven surface in contiguous relationship with said emulsion layer upon removal of said support from said aqueous bath.

7. The method of claim 1 wherein said emulsion layer is dry-stripped from another support before suspending in said aqueous bath.

8. An improved method of wet-transferring an unexposed photographic dry-stripped emulsion layer uniformly to an uneven-surfaced support, said method comprising suspending said emulsion layer in an aqueous bath comprising a saccharide at a concentration of from at least about 1 gram to about 200 grams per liter, positioning said support beneath and in contiguous relationship with said emulsion layer and removing said support bearing said emulsion layer from said aqueous bath.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,607,346 Dated September 21, 1971

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It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Title is incorrect. Should read --- Method of Wet Transferring Unexposed Photographic Emulsion Layers---.

Abstract, line 1, "sensitomeric" should read ---sensitometric---.

Column 2, line 44 (page 4, line 15 of the application), after "Table 1" insert ---below---.

Column 2, line 65 (page 4, line 36 of the application), "1.65" should read ---1.64---.

Signed and sealed this 11th day of April 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents