United States Patent [19]

Tsuji et al.

[11] **3,877,947**

[45] **Apr. 15, 1975**

[54] **PHOTOGRAPHIC ELEMENT**

[76] Inventors: **Nobuo Tsuji; Tatsuya Tajima; Yoshinori Tsuchiya,** all of No. 210, Nakanuma, Minami Ashigara-machi, Ashigara-Kamigun, Kanagawa, Japan

[22] Filed: **Apr. 3, 1973**

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Related U.S. Application Data

[62] Division of Ser. No. 219,179, Jan. 19, 1972.

[30] **Foreign Application Priority Data**

Jan. 19, 1971 Japan 46-13211

[52] **U.S. Cl.** ..... **96/87 R;** 96/85; 96/67; 96/114; 96/114.4; 96/114.5; 96/114.7; 117/161 R; 117/161 UC; 117/161 C

[51] **Int. Cl.** **G03c 1/78**

[58] **Field of Search** ..... 96/85, 67, 114, 114.4, 96/114.5, 114.7, 87 R; 117/161 R, 161 UC, 161 C

[56] **References Cited**

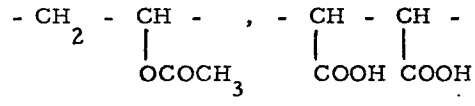
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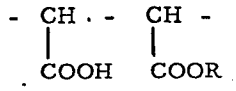
Primary Examiner—Norman G. Torchin
Assistant Examiner—Edward C. Kimlin
Attorney, Agent, or Firm—Sughrue, Rothwell, Mion, Zinn & Macpeak

[57] **ABSTRACT**

A photographic element for use in silver halide photography having a silver halide emulsion layer, a protective layer, a subbing layer or a diffusion-transfer image-receiving layer, each using gelatin as the main binding component, in which into one of said layers are incorporated a nonionic water-soluble polymer and a phase separation inhibitor containing the



and



groups in 50, 50 − X and X molar percent proportions, respectively, X being not more than 50 and R being an alkyl group having from 1 to 4 carbon atoms.

The photographic element has reduced propensity to curling and to becoming sticky after stabilization processing.

21 Claims, No Drawings

PHOTOGRAPHIC ELEMENT

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is a divisional application of our earlier co-pending application Ser. No. 219,179 filed on Jan. 19, 1972, and claims priority from Jan. 19, 1971 based on Japanese Patent Application No. 1321/71.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to photographic elements, and more particularly to composition of layers to be provided on a photographic element support.

2. Description of the Prior Art

Photographic elements in general comprise a support material such as paper, a synthetic resin film, a glass or metallic plate, with a subbing layer optionally being provided thereon for the purpose of enhancing the adhesivity between the support and photographic layer adjacent thereto, together with a silver halide emulsion layer, usually with a protective layer provided thereon to prevent damage to said emulsion layer, the latter two layers being applied onto the surface of the foregoing support or subbing layer. Furthermore, as one special kind of photographic material there is an image-receiving element used in the diffusion transfer photographic process, which element comprises an image-receiving layer having incorporated therein a catalytic substance, i.e., silver deposits or so-called development nuclei, in a dispersed form for reduction of a soluble silver complex transported by diffusion from a photographic light-sensitive element.

As the binding agent for these photographic elements, gelatin has heretofore been used in almost all cases due to its outstanding photographic and physical properties. Since gelatin is a natural substance, however, its use has suffered from the disadvantage that the properties of gelatin largely depend upon the raw materials and manufacturing processes used to form it; and often it is therefore not possible to insure constant quality in the finished product. Besides such a disadvantage, the use of gelatin presents some other problems. For instance, it is sensitive to changes in temperature and humidity and tends to curl. Furthermore, in the stabilization process wherein a photographic element is processed in a stabilizing solution containing ammonium thiocyanate, the surface of a gelatin film which constitutes a photographic layer becomes sticky after stabilization.

Recently, in an attempt to eliminate these defects, various kinds of synthetic polymers have been proposed as substitutes for gelatin as a binding agent for photographic layers. These include, for example, polyvinyl alcohol, polyacrylamide, polyvinyl pyrrolidone, poly-1-vinyl-2-methylimidazole, sodium polyacrylate, an acrylamide-1-vinyl-2-methylimidazole copolymer and an acrylamide-1-vinyl-2-methylimidazole-acrylic acid copolymer. These synthetic polymers, however, are not superior gelatin in various other photographic and physical properties, so that in practice gelatin is used.

It has been attempted to employ gelatin with such synthetic polymers, thereby maintaining the superior properties of the gelatin and compensating for the defects of the same by means of the properties of the synthetic polymers. However, when a portion of the gelatin is replaced by a nonionic water-soluble polymer, complete mixing of both components is optional proportions cannot be effected and phase-separation takes place.

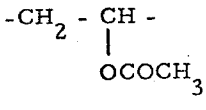
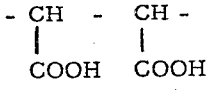
To attempt to overcome this effect, a method has been proposed wherein a third substance is added to prevent the phase separation. For example, in Japanese Patent Publication No. 4,272/64 there is described the use of a methyl vinyl ether — maleic anhydride copolymer (hereinafter referred to as MVE/MA) or an amide or ester thereof as a phase-separation inhibitor upon using gelatin with polyvinyl alcohol.

SUMMARY OF THE INVENTION

We have found that the compounds disclosed hereinafter are extremely effective as phase-separation inhibitors upon admixing gelatin with nonionic polymers. Furthermore, we have also confirmed the following advantages: the coating composition prepared using such compounds can be applied onto a support more uniformly than in the case of using the prior art phase-separation inhibitor, i.e., the above-described copolymer (MVE/MA) or an amide or ester thereof; the photographic elements produced have little tendency to curl, and they show little tendency to be sticky after stabilization, if such is used.

Thus, the present invention provides a photographic element comprising a support having thereon at least one layer comprising gelatin, a nonionic water-soluble polymer and a polymer, said polymer comprising 50 mole percent of vinyl acetate, $(50 - x)$ mole of maleic acid and x mole of half alkyl ester of maleic acid, wherein x is $0 \leqq x \leqq 50$ and the alkyl group has 1 to 4 carbon atoms.

The polymer of the present invention, which can be employed as an inhibitor for phase-separation between gelatin and the nonionic water-soluble polymer, may be characterized by the following chemical units and the specified proportion thereof.

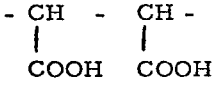
Unit No.	Atomic groups	Proportion contained
1		50 molar %
2		(50 - X) molar %

Unit No.	Atomic groups	Proportion contained
3	- CH(COOH) - CH(COOR) - (R being an alkyl group having from 1 to 4 carbon atoms.)	X molar % (X being not more than 50)

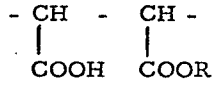
The nonionic water-soluble polymers which may be used in accordance with the present invention include polyvinyl alcohols, polymers of acrylamide or its derivatives such as acrylamide, N-methylacrylamide, N-ethylacrylamide, N, N-dimethylacrylamide, N, N-diethylacrylamide, N-methoxymethylacrylamide, N-ethoxymethylacrylamide, N-morpholinoacrylamide, or N-morpholinomethylacrylamide, the corresponding polymers of methyacrylamide or its derivatives, polyvinyl methyl ethers, polyvinyl pyrrolidones, polyvinyl oxazolidones, polyvinyl caprolactams, soluble starch and cellulosic derivatives such as hydroxyethyl cellulose or methyl cellulose. Besides these homopolymers, there may also be used water-soluble copolymers consisting of the monomer units mentioned above.

Among the nonionic water-soluble polymer polyvinyl alcohol is the most typical one. Any known polymer which is used together with gelatin in the photographic art may be employed.

The phase-separation inhibitors used according to the present invention may be obtained by synthesizing a 1 : 1 (polymerization ratio) copolymer of vinyl acetate and maleic anhydride by means of any conventional radical polymerization method, and heat-treating the copolymer in water or an alcohol having from 1 to 4 carbon atoms to effect hydrolysis or alcoholysis of the same. The decomposition reaction may also be partially carried out to produce the half ester. By the procedure, the



group which initially occupies 50 molar percent of the copolymer is converted into the



group by X molar percent. In the present invention, the above-described decomposition reaction can be eliminated, so that the range of X is $0 \leqq X \leqq 50$. The properties of the polymer are substantially not affected on the proportion of X.

Several examples of such phase-separation inhibitors will be given below where the values of the intrinsic viscosity are taken in a methanolic solution of each phase-separation inhibitor at 30.0°C.

			Intrinsic viscosity
I	Unit 1	50 molar %	0.64
	Unit 2	50 molar %	
II	Unit 1	50 molar %	0.73
	Unit 3	50 molar %	
	(R = ethyl)		
III	Unit 1	50 molar %	
	Unit 2	30 molar %	0.42
	Unit 3	20 molar %	
	(R = n - butyl)	(R means alkyl group of the half ester of maleic anhydride (see page 4), it relates to unit 3, not unit 1.)	
IV	Unit 1	50 molar %	
	Unit 2	20 molar %	0.52
	Unit 3	30 molar %	
	(R = methyl)		

According to the present invention, gelatin and the nonionic water-soluble polymer can be used in admixture with the phase-separation inhibiting polymer in photographic layers. These photographic layers include not only a light-insensitive layer such as a protective or uppermost layer, a subbing or under-coated layer, an image receiving layer for diffusion-transfer process, which layer may also contain "nuclei" for precipitating silver, such as colloidal silver or heavy metal sulfides, but also a light-sensitive layer such as a light-sensitive silver halide emulsion layer. The phase-separation inhibiting polymer of the present invention may be added to a mixture to be coated at any stage before coating. The polymer may also be added to a silver halide emulsion during preparation thereof.

The proportions of gelatin, nonionic water-soluble polymer and phase-separation inhibiting polymer may be varied depending upon the specific requirement of the photographic layers being produced and the specific compound to be used. In general, the preferred proportions are set out below.

gelatin	about 5 – about 70% by weight
nonionic water-soluble polymer	about 90 – about 15% by weight
phase-separation inhibitor	about 5 – about 15% by weight

The phase-separation inhibitors used according to the present invention may be of any molecular weight, although it is most preferred to use those having an intrinsic viscosity $[\eta]$, as measured in a methanolic solution at 30°C., of about 0.05 to about 5.0, preferably about 0.3 to about 2.0.

Suitable support material include any of those used in photography such as cellulose acetate, synthetic resins such as polyesters, polystyrenes or polycarbonates, paper, or resin coated paper such as polyethylene coated paper.

The copolymers used according to the present invention remarkedly improve the compatibility between gelatin and nonionic water-soluble polymers, and are extremely effective for the prevention of phase-separation which often takes place.

The present invention can be applied to varied silver halide emulsions using silver chloride, silver bromide, silver chlorobromide, silver iodobromide and/or silver chloroiodobromide, and mixtures thereof.

The emulsions to which the present invention may be applied may be chemically sensitized by any conventional method, for example using labile-sulfur containing compounds such as ammonium thiosulfate or allylthiourea (see, for example, P. Glafkindes, Chimie Photographique; 2 eme Edition Photocinema, Paul Montel, Paris, 1957, pages 297–299); gold compounds such as complexes of monovalent gold and thiocyanic acid (see Ibid., page 301) or any combination of these compounds. The emulsions may be optically sensitized by incorporating thereinto spectral sensitizers such as cyanine or merocyanine dyes (see, for example, Shinichi Kikuchi, et al, Kagaku-Shashin Binran, Maruzen Co., Ltd., 1959, pages 15–24). Furthermore, they may be stabilized by any stabilizers well known in the art, for example, heterocyclic compounds such as benzotriazole, 1-phenyl-5-mercaptotetrazole, 4-hydroxy-6-methyl-1,3,3a, 7-tetrazaindene or 6-thioctic acid, mercury compounds such as mercumallylic acid (see Japanese Patent Publication No. 22, 063/64), or benzenesulfonic acid. In addition, the emulsions may be hardened using hardening agents such as formaldehyde, mucochloric acid, chromium alum or triazine derivatives (see, for example, Belgian Pat. No. 641,044), or a combination of these hardeners with hardening adjuvants such as resorcin or resorcin aldehyde. Into the emulsions there may be incorporated surface active agents such as saponin, sodium alkylbenzene sulfonate or an addition polymer of an alkylphenol and sultone (see British Pat. No. 1,024,808) in order to facilitate the application of said emulsions. Furthermore, the emulsions may be sensitized using polyalkylene oxide derivatives such as condensation products of an alkylphenol and polyethylene oxide.

The emulsions prepared in accordance with the present invention can be used, after the addition of couplers, in the manufacture of natural color photographic films or papers. Furthermore, by increasing the ratio of the water-soluble polymer to gelatin, the developed film can be removed by means of rinsing, so that it may be used as a negative layer for use in the so-called multi-layer diffusion transfer process (C.E. Neblette, Photography, its Materials and Processes, 6th Edition, D. Van Nostrand Co., Princeton, New Jersey, 1962, pages 371–373)

The present invention will now be further illustrated by the following non-limitative examples.

EXAMPLE 1

A silver halide photographic emulsion thickness (4 microns) was prepared which contained 20 g. silver chloride and 10 g. gelatin, and was divided into three equal portions A, B and C. Into each portion there was added the following solutions, respectively:

Emulsion A — 200 cc. of a 10 weight percent aqueous solution of gelatin.

Emulsion B — 200 c.c. of a 10 weight percent aqueous solution of polyvinyl alcohol.

Emulsion C —180 c.c. of a 10 weight percent aqueous solution of polyvinyl alcohol plus 20 c.c. of 10 weight percent solution of a phase-separation inhibitor (I) in water: methanol (1 : 1 by weight).

Emulsions A, B and C each were thoroughly agitated and then applied onto a photographic baryta-coated paper (95 g./m.^{2}) to give the corresponding photographic paper, i.e., specimens A, B or C, respectively. These specimens were each exposed to light, processed in a developer and fixing solution having the following compositions, cut into a circular form of 10 cm. in diameter and dried for 24 hours at a temperature of 25°C and a relative humidity of 50 percent (Condition 1), or at a temperature of 25°C and relative humidity of 20 percent (Condition 2).

Composition of the developer:	
Metol	1.0 g.
Anhydrous sodium sulfite	15 g.
Hydroquinone	4 g.
Sodium carbonate monohydrate	27 g.
Potassium bromide	1.3 g.
Water to make 1,000 c.c.	
Composition of the fixing solution:	
Crystalline sodium thiosulfate	240 g.
Anhydrous sodium sulfite	15 g.
Glacial acetic acid	13.3 g.
Borax	7.5 g.
Potash alum powder	15 g.
Water to make 1,000 c.c.	

After drying each specimen under the conditions mentioned above, the curling value was determined by measuring across the center of the circular form the distance (x cm) between the tips which were closest upon the curling, and the value ($10 - x$) cm was taken as the curling value. The results of the measurement are shown in Table 1.

Table 1

Specimens	Condition 1	Condition 2
A	5.2 cm.	9.8 cm.
B	(Separation took place in the emulsion phase and uniform application was impossible.)	
C	0.4 cm.	1.2 cm.

As is evident from Table 1, the photographic paper using the compounds according to the invention (Specimen A) showed extremely low curling values as compared with the photographic paper using gelatin alone (Specimen A). No changes were found in the photographic properties between Specimens A and C.

EXAMPLE 2

A silver halide-gelatin emulsion (thickness: 4 microns) was prepared which contained 20 g. silver chloride and 10 g. gelatin, and, after addition of 10 g. hydroquinone as a developing agent, was divided into two equal portions A and B, into which were added the following solutions, respectively:

Emulsion A — 200 c.c. of a 10 weight percent aqueous solution of gelatin.

Emulsion B — 180 c.c. of a 10 weight percent aqueous solution of polyvinyl alcohol plus 20 c.c. of a 10 weight percent aqueous solution of a phase-separation inhibitor (I).

Emulsions A and B were each thoroughly agitated and applied onto a photographic base paper of 70 g./m.^{2} to give photographic papers A and B, respectively, for use in a stabilization process. These photographic papers were each developed in an activator having the composition shown below, after which they were processed in a stabilizing solution containing

NH_4SCN and then dried in a desiccator kept at a temperature of 25°C and a relative humidity of 50 percent. After drying, comparison was made of the stickiness of the photographic paper's emulsion surface, whereby it was found that the stickiness of Specimen B according to the present invention was extremely low as compared to Specimen A using gelatin alone, and the curling value of Specimen B was small, as in Example 1, and satisfactory.

Composition of the activator:	
Anhydrous sodium sulfite	45 g.
Sodium hydroxide	48 g.
Potassium bromide	1.3 g.
Water to make 1,000 c.c.	

EXAMPLE 3

A silver chlorobromide emulsion was prepared which contained 30 molar percent of silver bromide and 60 g. of gelatin and, after addition of 10 g. of hydroquinone as a developing agent, applied onto a photographic baryta-coated paper of 135 g./m². On top of the coating layer there was further applied a thin protective layer of the following composition, thereby giving a photographic paper for use in the stabilization process.

Formulation of the protective layer composition:	
Gelatin	5 g.
P.V.A.	15 g.
Phase-separation inhibitor (II)	1.5 g.
Water to make 1,000 c.c.	

The photographic paper was subjected to stabilization processing using the same activator and stabilizing solution as in Example 2, after which the stickiness of the photographic paper's surface was observed to be satisfactory.

EXAMPLE 4

Colloidal nickel sulfide nuclei were incorporated into an aqueous solution having the composition as shown below and applied onto a photographic base paper of 85 g./m². On top of the coating layer there was further applied a stripping layer mainly containing sodium alginate to give an image-receiving paper for use in the silver salt diffusion transfer process. The image-receiving paper was dipped for several seconds in a developer (composition is shown below) for use in the silver salt diffusion transfer process while held in tight surface contact with a negative paper having a silver halide emulsion layer for use in the diffusion transfer process, which negative paper had been exposed to light. The image-receiving paper, after being separated from the negative paper after 30 seconds showed an extremely low curling tendency and was satisfactory.

Amount of nickel sulfide in the layer was 0.6 mg/m². Amount of sodium alginate in the layer was 0.2 g/m².

Composition of the protective colloid solution into which colloidal nuclei are to be incorporated:	
Gelatin	20 g.
P.V.A.	30 g.
Phase-separation inhibitor (I)	4 g.
Water to make 1,000 c.c.	

Composition of the developer for use in the silver salt diffusion transfer process:	
Anhydrous sodium thiosulfate	23 g.
Potassium sulfite	69 g.
potassium bromide	0.5 g.
Hydroquinone	13 g.
Phenidone	1 g.
Sodium hydroxide	10 g.
Water to make 1,000 c.c.	

EXAMPLE 5

A silver halide-gelatin emulsion was prepared which contained 20 g. AgCl and 10 g. gelatin; and was divided into four equal portions, into which the following compounds were added, respectively:

Sample	Substances added
A	200 c.c. of a 10% aqueous solution of gelatin
B	A mixture of 180 c.c. of a 10% aqueous solution of hydroxyethyl cellulose and 20 c.c. of a 10% aqueous solution of phase-separation inhibitor (II) (Substances according to the invention).
C	A mixture of 180 c.c. of a 10% aqueous solution of acrylamide and 20 c.c. of a 10% aqueous solution of phase-separation inhibitor (III). (Substances according to the invention)
D	A mixture of 180 c.c. of a 10% aqueous solution of P.V.A. and 20 c.c. of a 10% aqueous solution of phase-separation inhibitor (IV) (Substances according to the invention).

Emulsions A to D were each thoroughly agitated and then applied onto a photographic baryta-coated paper of 95 g./m² to give corresponding photographic papers. These photographic papers were subjected to the same processing as in Example 1 and examined for their curling properties to find that the samples B to D using the substances of the invention showed little curling tendency and were satisfactory as compared with sample A using gelatin alone.

The invention has been described in detail with particular reference to preferred embodiments thereof but it will be understood that variations and modifications can be effected within the spirit and scope of the invention as described hereinabove and as defined in the appended claims.

What we claim is:

1. A light-sensitive photographic element comprising a support having thereon at least one silver halide emulsion layer which consists essentially of silver halide, gelatin, a nonionic water-soluble polymer which is photographically compatible with said gelatin and a polymer which is a phase-separation inhibitor for said gelatin and said nonionic water-soluble polymer, said polymer comprising 50 mole percent of vinyl acetate (50 − X) mole percent of maleic acid and X mole percent of a half alkyl ester of maleic acid, wherein X is $0 \leqq X \leqq 50$ and the alkyl group in said half alkyl ester has 1 to 4 carbon atoms, wherein the proportion of said gelatin, said nonionic water-soluble polymer and said polymer is about 5 to about 70 percent by weight, about 90 to about 15 percent by weight and about 5 to about 15 percent by weight, respectively.

2. A light-sensitive photographic element comprising a support having thereon at least two layers, at least one of said layers being a silver halide emulsion layer and at least one of said layers containing gelatin, a nonionic water-soluble polymer which is photographically compatible with said gelatin and a polymer which is a phase-separation inhibitor for said gelatin and said nonionic water-soluble polymer, said polymer comprising 50 mole percent of vinyl acetate, (50 − X) mole percent of maleic acid and X mole percent of a half alkyl

ester of maleic acid, wherein X is $0 \leqq X \leqq 50$ and said alkyl group in said half alkyl ester has 1 to 4 carbon atoms, wherein the proportion of said gelatin, said nonionic water-soluble polymer and said polymer is about 5 to about 70 percent by weight, about 90 to about 15 percent by weight and about 5 to about 15 percent by weight, respectively, said at least one of said layers which contains gelatin, a nonionic water-soluble polymer and a polymer consisting essentially of said components, with the proviso that when said components are in a silver halide emulsion layer silver halide is further present.

3. A light-sensitive photographic element as claimed in claim 1 wherein 50 mole percent, $(50 - X)$ mole percent and X mole percent total 100 mole percent.

4. A light-sensitive photographic element as claimed in claim 1 wherein said nonionic water-soluble polymer is selected from the group consisting of polyvinyl alcohol; polymers of an acrylamide or methacrylamide, polyvinyl methyl ether, polyvinyl pyrrolidone, polyvinyl oxazolidone, polyvinyl caprolactams, soluble starch and cellulose derivatives.

5. A light-sensitive photographic element as claimed in claim 1 wherein X is 50 and said phase-separation inhibitor has an intrinsic viscosity, measured in a methanolic solution at 30°C, of 0.64.

6. A light-sensitive photographic element as claimed in claim 1 wherein said phase-separation inhibitor contains said vinyl acetate and said half alkyl ester of maleic acid in which the alkyl group of said half alkyl ester is an ethyl group, in 50 molar percent proportions, respectively, said phase-separation inhibitor having an intrinsic viscosity, measured in a methanolic solution at 30°C, of 0.73.

7. A light-sensitive photographic element as claimed in claim 1 wherein said phase-separation inhibitor contains said vinyl acetate, said maleic acid and said half alkyl ester of maleic acid, the alkyl group of said half alkyl ester being an n-butyl group, in 50, 30 and 20 molar percent proportions, respectively, said inhibitor having an intrinsic viscosity, measured in a methanolic solution at 30°C, of 0.2.

8. A light-sensitive photographic element as claimed in claim 1 wherein said phase-separation inhibitor contains said vinyl acetate, said maleic acid and said half alkyl ester of maleic acid, the alkyl group of said half alkyl ester being a methyl group, in 50, 20 and 30 molar percent proportions, respectively, said phase-separation inhibitor having an intrinsic viscosity, measured in a methanolic solution at 30°C, of 0.52.

9. A light-sensitive photographic element as claimed in claim 1 wherein said phase-separation inhibitor has an intrinsic viscosity measured in a methanolic solution at 30°C in the range of from 0.3 to 2.0.

10. A light-sensitive photographic element as claimed in claim 1 wherein said polymer contains said half alkyl ester of maleic acid.

11. A light-sensitive photographic element as claimed in claim 2 wherein said nonionic water-soluble polymer is selected from the group consisting of polyvinyl alcohol; polymers of an acrylamide or methacrylamide, polyvinyl methyl ether, polyvinyl pyrrolidone, polyvinyl oxazolidone, polyvinyl caprolactams, soluble starch and cellulose derivatives.

12. A light-sensitive photgraphic element as claimed in claim 2 wherein X is 50 and said phase-separation inhibitor has an intrinsic viscosity, measured in a methanolic solution at 30°C, of 0.64.

13. A light-sensitive photographic element as claimed in claim 2 wherein said phase-separation inhibitor contains said vinyl acetate and said half alkyl ester of maleic acid, in which the alkyl group of said half alkyl ester is an ethyl group, in 50 molar percent proportions, respectively, said phase-separation inhibitor having an intrinsic viscosity, measured in a methanolic solution at 30°C, of 0.73.

14. A light-sensitive photographic element as claimed in claim 2 wherein said phase-separation inhibitor contains said vinyl acetate, said maleic acid and said half alkyl ester of maleic acid, the alkyl group of said half alkyl ester being an n-butyl group, in 50, 30 and 20 molar percent proportions, respectively, said inhibitor having an intrinsic viscosity, measured in a methanolic solution at 30°C, 0.2.

15. A light-sensitive photographic element as claimed in claim 2 wherein said phase-separation inhibitor contains said vinyl acetate, said maleic acid and said half alkyl ester of maleic acid, the alkyl group of said half alkyl ester being a methyl group, in 50, 20 and 30 molar percent proportions, respectively, said phase-separation inhibitor having an intrinsic viscosity, measured in a methanolic solution at 30°C, of 0.52.

16. A light-sensitive photographic element as claimed in claim 2 wherein said phase-separation inhibitor has an intrinsic viscosity measured in a methanolic solution at 30°C in the range of from 0.3 to 2.0.

17. A light sensitive photographic element as claimed in claim 2 wherein said polymer contains said half alkyl ester of maleic acid.

18. A light-sensitive photographic element as claimed in claim 2 wherein 50 mole percent, $50 - X$ mole percent and X mole percent total 100 mole percent.

19. A light-sensitive photographic element as claimed in claim 2 wherein said at least one layer is a protective layer.

20. A light-sensitive photographic element as claimed in claim 2 wherein said at least one layer is a subbing layer.

21. A light-sensitive photographic element as claimed in claim 2 wherein at least one layer is an image-receiving layer for a diffusion transfer process.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,877,947

DATED : April 15, 1975

INVENTOR(S) : Nobuo TSUJI et al

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

IN THE HEADING:

Foreign Application Priority Data

Delete-- 46-13211-- insert.....1321/71

Signed and sealed this 10th day of June 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks