

[54] **ELECTROSTATIC IMAGE-RECORDING
MEDIUM AND METHOD OF MAKING
SAME**

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[57] **ABSTRACT**

An electrostatic image-recording medium comprising a conductive base support having a dielectric layer which comprises a linear polymer having a specific volume resistivity of over $10^{12}\Omega\text{-cm}$ and being soluble in a solvent selected from the group consisting of aromatic hydrocarbons, ketones and having fine grains of esters and having fine grains of polycarbonate resin dispersed in said linear polymer; and the process of producing it.

10 Claims, No Drawings

ELECTROSTATIC IMAGE-RECORDING MEDIUM AND METHOD OF MAKING SAME

SUMMARY OF THE INVENTION

The present invention relates to an electrostatic image-recording medium to be used for facsimile or high speed printing and to a method of manufacturing said medium, or more specifically, to an electrostatic image-recording medium characterized by excellent moisture-proof image quality and writing quality, which looks just like ordinary paper, and is produced by using a linear polymer (hereafter to be called the component A) having a specific volume resistivity of over $10^{12}\Omega\text{-cm}$ that is soluble in a solvent selected from the group consisting of aromatic hydrocarbons, ketones, and esters as the main component of the dielectric layer of said medium, and a polycarbonate resin (hereafter to be called the component B) as its secondary component; dissolving the component A in a solvent selected from the above mentioned solvents and the component B in a halogenated hydrocarbon, and mixing them together into a dispersion; and applying said dispersion on a conductive base support.

As is wellknown, the principle of electrostatic recording is as follows: A dielectric substance is employed as a recording layer. An electrostatic image-recording medium bears an electrostatic latent image in several manners. For example; the medium is so positioned that its conductive side comes in contact with a backing electrode of an electrostatic recorder. Then, with a metal stylus being brought into virtual contact with the dielectric surface of the medium and applying a voltage to the medium, a charge pattern will be generated by moving the medium and the stylus relative to one another. The latent image thus obtained can be developed by the toning based upon the wellknown magnetic brush method.

The requirement of an image-recording medium to be used in such electrostatic recording are:

1. excellent image quality such as density, clearness, and the absence of fogging;
2. moisture proofness and temperature proofness;
3. excellent pencil or ink writing quality;
4. no gloss and paperlike surface;
5. no curling;
6. no odor;
7. permanence, and so on.

There is as yet no image-recording medium available which can meet all these requirements at the same time. In particular, it is extremely difficult to secure good image quality with good writing quality and paperlike surface even under high humidity conditions.

The most effective and most popular method of imparting the necessary writing quality and paper-likeness to the image-recording medium in conventional practice has been to make the surface of the image-recording medium rough by employing as the material for the dielectric layer a composition comprising an insulating resin pigmented with an inorganic filler such as zinc oxide, titanium oxide, silica, clay or alumina.

An electrostatic image-recording medium using such an inorganic filler may acquire a desirable writing quality and paperlike surface, but it has the fatal drawback that the image formed thereon is not moisture-proof. Under normal conditions it can produce a good, clear image, but since the inorganic filler contained is more

or less hygroscopic, it is adversely affected by the ambient humidity, and in a high-humidity atmosphere it frequently results in low image density or a fogged image.

- 5 In areas subject to wide fluctuations in humidity depending on the season, an image-recording medium lacking in moisture-proof image quality is practically useless. Thus an electrostatic image-recording medium having stable recording characteristics regardless of changes in humidity would be most desirable.

Working from this standpoint, the present inventors have succeeded in perfecting the present invention after various studies seeking a method to obtain an electrostatic image-recording medium which excels in image quality under high humidity conditions and at the same time possesses good writing quality and a paperlike surface.

In their efforts, the present inventors gave up on the use of any inorganic filler and tried the application of a polymer blend technique for this purpose and have been able to obtain an electrostatic image-recording medium which satisfies all the requirements of moisture-proof image quality, writing quality, and paperlike surface by appropriately selecting the types and combinations of polymer and solvent.

The present invention relates to an electrostatic image-recording medium which excels in moistureproof image quality, writing quality and looks just like common paper. It is manufactured by using a linear polymer (component A) as the main component of the dielectric layer and a polycarbonate resin (component B) as the secondary component. Component A is dissolved in a solvent selected from the group consisting of aromatic hydrocarbons, ketones and esters, and component B is dissolved in a halogenated hydrocarbon. These two solutions are blended to precipitate component B as a fine gel with good dispersion stability. The dispersion thus obtained is then applied to a conductive base support.

The essential feature of the present invention is that component B, which is rather incompatible with component A, i.e., the main component of the dielectric layer, and has a high second order transition point, is taken as the secondary component, while the solvent employed is a combination of a solvent selected from the group consisting of aromatic hydrocarbons, ketones and esters which dissolves the component A well, but does not dissolve the component B; and a halogenated hydrocarbon which mixes well with said solvent and readily dissolves both components A and B. Only when this condition is satisfied, is a dispersion with the component B dispersed as a fine gel produced when the solution of component A and the solution of component B are mixed together.

Since this dispersion is characterized by very high dispersion stability, it does not coagulate even when stored for several weeks following its preparation. Moreover, by applying this dispersion to a base support which has first been treated to lower its electrical resistance, a film is formed which comprises a continuous layer of linear polymer with a polycarbonate resin dispersed therein. Since the polycarbonate resin is evenly distributed as very fine grains of less than one-tenth μ in size throughout the surface and thickness of the film, the surface can become matt without any loss in the charge acceptance and in its image quality and thus an

electro-static image-recording medium with an improved writing quality can be obtained.

As the polycarbonate resin is by far less hygroscopic than inorganic substances such as zinc oxide, titanium oxide, silica and alumina, the electrostatic image-recording medium using the polycarbonate resin is less vulnerable to the ambient humidity and excels in moistureproof image quality. Furthermore, with its second order transition point as high as about 150°C, it is less affected by the drying conditions during the coating process and by the heating conditions in the fixing process of imaging and it looks just as non-glossy and stable as ordinary paper.

To define the present invention more concretely, it related to an electrostatic image-recording medium which possesses excellent moisture-proof image quality and writing quality and has the same outward appearance as ordinary paper. This product is manufactured by using component A as the main component for the dielectric layer and component B as the secondary component, and dissolving component A in a solvent selected from the group consisting of aromatic hydrocarbons, ketones, and esters and dissolving component B in a halogenated hydrocarbon. These two solutions are blended to precipitate component B as a fine gel with superior dispersion stability, and the resulting dispersion is then applied to a conductive base support such as a conductive paper or film.

The linear polymer to be employed in the present invention can be anything that meets the conditions of being soluble in a solvent selected from the group consisting of aromatic hydrocarbons, ketones and esters and having a specific volume resistivity of over $10^{12}\Omega\text{-cm}$. Appropriate substances for the purpose include the so-called vinyl polymers or copolymers derived from the monomer such as styrene, acrylic monomers, vinyl

polymethylacrylate, polymethylmethacrylate, polyethylmethacrylate, polystyrene, polyvinylchloride, polyvinylacetate; and copolymers such as methyl methacrylate/methyl acrylate, methyl methacrylate/butyl methacrylate, methyl methacrylate/ethyl acrylate/monomethyl itaconate, methyl acrylate/styrene, methyl acrylate/dimethyl itaconate, vinylchloride/vinyl acetate, vinylidene chloride/acrylonitrile, vinylidene chloride/vinylchloride, vinylacetate/crotonic acid, styrene/acrylonitrile, styrene/acrylic acid, styrene/methyl methacrylate, styrene/lauryl methacrylate, styrene/butyl acrylate, styrene/vinyl acetate, methyl acrylate/diethyl itaconate, methyl methacrylate/ α -methylstyrene, methyl methacrylate/lauryl methacrylate/acrylic acid, butyl methacrylate/methyl methacrylate/monomethyl itaconate, vinyl chloride/diethyl maleate, vinyl chloride/vinyl stearate, vinyl chloride/methyl acrylate, vinyl chloride/2-ethyl hexyl acrylate, vinylidene chloride/methyl acrylate, vinyl acetate/maleic acid, vinylacetate/acrylonitrile.

Suitable saturated linear polyesters are those derived from a bifunctional carboxylic acid or its ester and a bifunctional alcohol: for example, copolymerized polyesters having low crystallivity or being amorphous and high solubility to the above mentioned solvents such as a copolyester of ethylene terephthalate/ethyleneisophthalate, a copolyester of ethyleneterephthalate/2,2-bis [4-(β -hydroxyethoxy) phenyl] propaneterephthalate, a copolyester of bis (β -hydroxyethyl)terephthalate/2,2-bis [4-(β -hydroxy-ethoxy)phenyl] propaneterephthalate, a copolyester of diphenolterephthalate/diphenolisophthalate, and a copolyester of 2,2-bis [4-(β -hydroxyethoxy) phenyl] propaneterephthalate.isophthalate/neopentylglycol-terephthalate.isophthalate, methyl-2-propyl-1,3-propanediolterephthalate.isophthalate/ethylene-terephthalate.isophthalate.

TABLE 1

Linear polymers	Specific volume resistivity($\Omega\text{-cm}$)
Polystyrene	$10^{17}\text{--}10^{19}$
Copolymer of styrene/acrylonitrile	$>10^{16}$
Copolymer of styrene/methyl methacrylate	$>10^{16}$
Polymethylmethacrylate	$>10^{15}\text{--}10^{16}$
Copolymer of methyl methacrylate/butyl methacrylate	10^{15}
Copolymer of methyl methacrylate/ethyl acrylate/monomethyl itaconate	$10^{14}\text{--}10^{15}$
Copolymer of methyl methacrylate/ α -methylstyrene	10^{18}
Polyvinyl chloride	$10^{14}\text{--}10^{16}$
Copolymer of vinyl chloride/vinyl acetate	$10^{14}\text{--}10^{16}$
Copolymer of vinylidene chloride/acrylonitrile	$10^{14}\text{--}10^{15}$
Copolymer of vinylidene chloride/vinyl chloride	$10^{13}\text{--}10^{15}$
Polyvinyl acetate	10^{13}
Copolymer of vinylacetate/crotonic acid	$10^{12}\text{--}10^{13}$
Copolycondensate of ethyleneterephthalate/ethyleneisophthalate	10^{17}
Copolycondensate of ethyleneterephthalate/2,2-bis 4-(β -hydroxyethoxy)phenyl propaneterephthalate	10^{16}
Copolycondensate of bis (β -hydroxyethoxy) terephthalate/2,2-bis 4-(β -hydroxyethoxy)phenyl propaneterephthalate	10^{17}

chloride, vinylidene chloride or vinyl acetate, or saturated linear polyesters.

Linear polymers suitable for use in the present invention are specifically enumerated with examples of the values of their specific volume resistivity (as measured according to ASTM D-257, i.e., at 23° - 25°C, 50 percent RH) in Table 1, which follows.

Suitable vinyl resins include: homopolymers such as

Suitable polycarbonate resins are: polycarbonates manufactured from 4,4'-dihydroxydiarylethane and the derivatives thereof; for example, a polycarbonate from 4,4'-dihydroxydiphenylpropane (bis phenol A), a polycarbonate from tetrachlorobisphenol A, a polycarbonate from 4,4'-dihydroxydiphenyl norbornylmethane, a polycarbonate from 4,4'-dihydroxy 3,3', 5,5'-tetrachlorodiphenylnorbornylmethane, a copolycarbonate from bis phenol A and tetrachlorobisphenol A,

a copolycarbonate from bisphenol A and 4,4'-dihydroxydiphenylether, or a copolycarbonate from bisphenol A and 4,4'-dihydroxydiphenylsulfone.

Suitable solvents for dissolution of component A include a single or mixed solvent selected from the group consisting of aromatic hydrocarbons such as benzene, toluene, xylene, ketones such as acetone, methylethylketone, methylisobutylketone; and esters such as ethyl acetate.

Suitable halogenated hydrocarbons for dissolution of component B include: methylene chloride, ethylene chloride, monochlorobenzene, methylchloroform, trichloroethylene, tetrachloroethane. The solution of component A and the solution of component B may be blended in any suitable manner. A ball mill or a Szegvari's attriter (a kind of grinding machine) will suffice for the purpose.

As the conductive base support to be employed in the present invention, anything in the well known technique can be adopted, it is well known that a base support with low electric resistance is preferred for the electrostatic image-recording medium in order to distribute as much of the applied voltage as possible in the dielectric recording layer.

In such a conductive base support the specific surface resistivity must usually be $10^5 - 10^9 \Omega$, or the specific volume resistivity must be $10^6 - 10^9 \Omega \cdot \text{cm}$ at a humidity of 30 - 90 percent R.H.

For this purpose, in the paper-making process, a known conductive agent such as poly(N,N-dimethyl

toluene solution of a copolymer of methyl methacrylate/butyl methacrylate (copolymerization mol ratio 75:25) were poured in various proportions into a porcelain ball mill to be mixed and dispersed for 24 hours. The dispersion thus obtained were applied over a 56 μ thick conductive paper made from a pulp compound of bleached hard wood sulfate pulp (LBKP) 70 parts, bleached soft wood sulfate pulp (NBKP) 30 parts, rosin size one part, and clay 10 parts and surface-sized with a mixed solution consisting of 5 parts of 4 percent aqueous solution of PVA and 3 parts of a 20 percent aqueous solution of poly(N,N-dimethyl-3,5-methylenepiperidinium chloride). The paper was then dried to form a dielectric layer 5 μ thick thereon.

The electrostatic recording paper thus obtained was so positioned as its conductive side comes in contact with a backing electrode of an electrostatic recorder. With a belt-type single stylus being brought into virtual contact with the dielectric surface of the electrostatic recording paper and applying voltage of minus 500 V to the electrostatic recording paper, a charge pattern was generated in accordance with electrically pulsing by moving the electrostatic recording paper and the stylus relative to one another. The latent image thus obtained was developed by the toning based upon the wellknown magnetic brush method.

The image quality, gloss, and writing quality of images reproduced under an applied voltage of minus 500 V to the electrostatic recording paper thus obtained, are given in Table 2.

TABLE 2

Constitution of dielectric layer		Blend ratio:					Silica/ methacrylester resin*
		polycarbonate solution/ methylmethacrylate- butylmethacrylate solution					
		0-/100 (product)	10/90 (product according to the invention)	15/85	25/75	40/60	
Image quality	20%– 60% R.H.	Image density high	Same as left	Same as left	Same as left	Same as left	Same as left
	60%– 80% R.H.	Image density high	Same as left	Same as left	Same as left	Same as left	Density very low
	Gloss	Very strong	Low; paper- like	Same as left	Same as left	Same as left	Same as left
Writing quality		Impossible to write on with pencil or ink	Good to write on with pencil or ink	Same as left	Same as left	Same as left	Same as left

(Note)

*Electrostatic image-recording paper coated with a dispersion which represents a toluene solution of a copolymer of methylmethacrylate-butyl methacrylate (copolymerization mol ratio 75:25) mixed and dispersed with silica in the amount of 15% by weight relative to polymer.

3,5-methylene piperidinium chloride), polyvinyl benzyl trimethyl ammonium chloride, or poly(2-methacryl oxyethyl trimethyl ammonium chloride) is introduced into the material, or such a conductive agent is applied on a paper base or on a film base, in order to obtain a conductive base with a desirable value of electric resistance.

Several specific examples of the present invention are given below:

EXAMPLE 1

A 20 percent methylene chloride solution of a polycarbonate produced from bisphenol A and a 20 percent

As seen from Table 2, an electrostatic image-recording paper of the present invention produced by using a polycarbonate and copolymer of methyl methacrylate-butyl methacrylate solution is excellent with respect to moistureproof image quality, gloss and writing quality, but an electrostatic image-recording paper produced using no polycarbonate or using silica is either unsatisfactory with respect to gloss and writing quality or poor in moisture-proof image properties.

Even where the ratio of polycarbonate/methylmethacrylate-butylmethacrylate was less than 10/90, more improved effects in gloss and writing quality are accomplished than where polycarbonate is not added.

However, at this low polycarbonate ratio it can not be said that the improved effects are conspicuous.

On the other hand, where the ratio was more than 40/60, the effects are, of course, remarkably high. However, from an economical standpoint it is not preferable to use a large amount of costly polycarbonate.

EXAMPLE 2.

Forty parts of a 10 percent tetrachloroethane solution of a polycarbonate obtained from tetrachlorobisphenol A and 130 parts of a 15 percent toluene solution of polymethylmethacrylate were poured into a Szegvari's attriter to be stirred and mixed for about 2 hours.

The dispersion thus obtained was immediately applied to a conductive paper which had been prepared in Example 1 and was dried. The electrostatic recording paper thus obtained was tested for image quality by the same method as in Example 1. Even under high humidity, high temperature conditions of 90 percent R.H., 35°C, the image was dense and clear with good contrast; gloss was low; a paperlike appearance was obtained; and good writing quality was exhibited. The same dispersion was then left to stand for 2 weeks before being applied to the conductive paper and the resulting recording paper was tested for image quality, gloss and writing quality. It was found as good in all these respects as the recording paper obtained using a dispersion just after it had been prepared.

EXAMPLE 3.

Sixty parts of a 10 percent ethylene chloride solution of a polycarbonate obtained from 4,4'-dihydroxydiphenyl norbornyl methane and 110 parts of a 15 percent xylene solution of a terpolymer (copolymerization mol ratio: 16/24/1.6) of methyl methacrylate/ethyl acrylate/monomethyl itaconate were poured into a Szegvari's attriter and stirred and mixed for 1.5 hours. The dispersion thus obtained was applied to the conductive paper as in Example 1, thereby producing an electrostatic recording paper. When tested, this recording paper proved satisfactory in moisture-proof image quality, gloss and writing quality.

EXAMPLE 4

Twenty parts of a 20 percent methylene chloride solution of a polycarbonate obtained from bisphenol A and 80 parts of a 20 percent toluene-methylethylketone solution (weight ratio of mixed solvent: 15/85) of a copolymer of vinyl acetate/crotonic acid (copolymerization mol ratio 97:3) were poured into a Szegvari's attriter for 1.5 hours of stirring and

mixing. Using the dispersion thus obtained, an electrostatic recording paper was produced in the same way as in Example 1. Tests showed that this paper was matt enough, had good writing quality and high moisture-proof image quality at 35°C, 80 percent R.H.

EXAMPLE 5

Except for the use of 80 parts of a 20 percent ethylacetate solution of a copolymer (copolymerization mol ratio 70:30) of vinylidene chloride/vinyl chloride instead of a copolymer of vinyl acetate/crotonic acid, the process was absolutely the same as in Example 4. The resulting electrostatic recording paper was quite matt, looking just like ordinary paper; was good to write on; and even under high humidity, high temperature conditions of 90 percent R.H., 35°C, it produced an image with sufficient density.

EXAMPLE 6

Except for the use of 75 parts of an 18 percent toluene solution of a copolymer (copolymerization mol ratio 80:20) of styrene/2-ethylhexyl acrylate instead of a copolymer of vinyl acetate/crotonic acid, the same process as in Example 4 was employed to produce an electrostatic recording paper. The recording paper obtained was matt; good to write on; exhibited ample image density under low humidity, low temperature conditions of 20 percent R.H., 10°C as well as under high humidity, high temperature conditions of 90 percent R.H., 30°C; and did not curl up at all.

EXAMPLE 7

A 20 percent methylene chloride solution of a polycarbonate obtained from bisphenol A and a 20 percent methylethylketone solution of a copolyester (weight ratio of copolymerization 60:40) of ethyleneterephthalate 1,2-bis [4-(β -hydroxyethoxy)phenyl] propaneterephthalate were poured in various proportions into a porcelain ball mill and after about 24 hours of mixing for dispersing a polycarbonate was precipitated as a fine gel with good dispersion stability. Various dispersion thus obtained were applied to a 56 μ thick conductive paper made from 70 parts of LBKP 30 parts of NBKP, one part of rosin size and 10 parts of clay and surface-sized with a mixture aqueous solution of PVA and poly(vinylbenzyl trimethyl ammonium chloride). The coated paper was then dried, yielding a 5 μ thick dielectric layer.

On the electrostatic recording papers thus produced, an image was reproduced according to the same method as in Example 1. The image quality, gloss and writing quality exhibited thereby are summarized in Table 3.

TABLE 3

weight ratio) Constitution of dielectric layer		Compound ratio of polycarbonate solution/ copolymerized polyester					Silica/copoly- merized polyester * (weight ratio)
		0/100	10/90	15/85	25/75	40/60	
		(product)	(product according to the invention)				(product)
Image quality	70%— 60% R.H.	Image density high	Same as left	Same as left	Same as left	Same as left	Same as left
	60%— 90% R.H.	Image density high	Same as left	Same as left	Same as left	Same as left	Image density very low

TABLE 3—Continued

weight ratio) Constitution of dielectric layer	Compound ratio of polycarbonate solution/ copolymerized polyester					Silica/copoly- merized polyester * (weight ratio)
	0/100 (product)	10/90	15/85	25/75	40/60	
Glossiness	Extremely glossy	Non-glossy looks paperlike	Same as left	Same as left	Same as left	Same as left
Writing quality	Unfit to write with pencil or ink	Fit to write with pencil or ink	Same as left	Same as left	Same as left	Same as left

(Note) *Electrostatic image-recording paper which has been coated with a dispersion obtained by dispersing silica in the amount of 15% by weight to the polymer in a methylethylketone solution of the above-mentioned copolymerized polyester.

As seen from Table 3, the electrostatic recording paper of this invention produced using a polycarbonate and a copolyester of ethyleneterephthalate/2,2-bis [4-(β -hydroxyethoxy)phenyl] propaneterephthalate is found satisfactory with respect to moistureproof image quality, gloss and writing quality, but a similar paper containing no polycarbonate or using silica is found either unsatisfactory with respect to gloss and writing quality or poor in moistureproof image quality and accordingly judged unfit for practical use.

EXAMPLE 8

Forty parts of a 10 percent tetrachloroethane solution of a copolycarbonate obtained from bisphenol A and tetrachlorobisphenol A, and 130 parts of a 15 percent toluene/acetone solution (weight ratio 7:3) of a copolyester of bis(β -hydroxyethyl)terephthalate/2,2-bis [4-(β -hydroxyethyl)phenyl] propaneterephthalate were poured into a Szegvari's attriter for about 2 hours of stirring and mixing.

A dispersion thus obtained was immediately applied to a conductive paper which had been prepared in Example 1 and was dried. The electrostatic recording paper thus obtained was tested according to the same method as Example 1. Testing showed that this paper could reproduce a clear image of good contrast with high density even under high humidity, high temperature conditions of 90 percent R.H., 35°C; it exhibited a low gloss; looked paperlike; and proved good to write on.

A similar evaluation was made of a paper which was spread with a two weeks old dispersing solution. The results turned out just as satisfactory as to image quality, gloss and writing quality as in the case of the paper coated with a dispersing solution just after the solution had been prepared.

EXAMPLE 9

Sixty parts of a 10 percent ethylene chloride solution of a copolycarbonate obtained from bisphenol A and 4,4'-dihydroxydiphenylsulfone and 110 parts of a 15 percent toluene/methylethyl ketone/ethylene acetate solution (weight ratio:2/1/1) of a copolyester (weight ratio of copolymerization 70:30) of neopentyl glycol terephthalate/2,2-diethyl-1,3-propanediolisophthalate were poured into an Szegvari's attriter for 1.5 hours of stirring and mixing. The dispersion thus obtained was applied to the same conductive paper as in Example 1, producing an electrostatic recording paper. Evaluation of the paper showed that its moistureproof image quality, gloss and writing quality were all satisfactory even at 20°C, 90 percent R.H.

EXAMPLE 10

Twenty parts of a 20 percent methylene chloride solution of a polycarbonate obtained from bisphenol A and 80 parts of a 20 percent toluene-methylethylketone solution (weight ratio of mixed solvent: 15/85) of ethyleneterephthalate/ethylenisophthalate/2-methyl-2-propyl-1,3-propane diol.terephthalate/2-methyl-2-propyl-1,3-propanediolisophthalate (weight ratio of copolymerization 40:40:10:10) were poured into a Szegvari's attriter for 1.5 hours of stirring and mixing. An electrostatic recording paper produced in accordance with the method of Example 7, using the dispersion thus obtained, was found matt enough and good to write on.

The dielectric layer surface of said electrostatic recording paper was tightly pressed by a metal roll against a photo conductive selenium plate bearing an electrostatic latent image with a surface potential of plus 1,000 V. This metal roll had been first charged with minus 600 V.

Next, the paper was separated from the surface of said selenic plate; the electrostatic latent image had been transferred to the paper.

The paper thus transferred now holding said latent image was developed by immersion in a liquid developer, i.e., an insulating liquid suspended with a toner particle having of negative polarity and a very clear image with high density and little fogging emerged. Even under high temperature, high humidity conditions of 35°C, 90 percent R.H., no deterioration of image quality occurred.

EXAMPLE 11

Twenty parts of a 20 percent methylene chloride solution of a polycarbonate obtained from bisphenol A and 80 parts of a 20 percent toluene/methylethylketone solution (weight ratio 6:4) of a copolymer (copolymerization mol ratio 75:25) of vinyl chloride/vinyl acetate were poured into a Szegvari's attriter for 2 hours of stirring and mixing.

Meanwhile, a 40 μ thick conductive film was prepared by spreading an aqueous solution of poly-(2-methacryl oxyethyl trimethyl ammonium chloride) on a Mylar film (trade name of a polyethylene terephthalate film produced by E.I. du Pont de Nemours & Co., Inc.); and on the low resistance surface of this film, a dispersion obtained as above was applied and dried to form a 4 μ thick dielectric layer.

On the electrostatic recording film thus obtained, an image was reproduced under a charge of minus 600 V using an electrostatic recorder which employs a so-called Multistylus, i.e., a multi-stylus electrode. Even

under the conditions of 30°C, 85 percent R.H., the reproduced image was dense and clear, with good contrast. The image-recording surface of the film was matt, paperlike in appearance and permitted satisfactory writing with a pencil or ink.

EXAMPLE 12-32

In each Example, a suitable linear polymer and its solvent and a suitable polycarbonate resin and its sol-

vent were used as shown in the Table 4. In each case, 20 parts of 20 percent linear polymer solution and 80 parts of 20 percent polycarbonate solution were poured into the attriter and were stirred and mixed for two hours. Using the dispersion thus obtained, electrostatic recording paper was prepared according to the method of Example 1. In all cases, the electrostatic recording paper obtained were low in gloss, excellent in writing quality and had good moisture proofness under high humidity conditions.

TABLE 4

Example No.	Linear polymers (Copolymerization mol ratio)	Solvents for Linear polymers (Weight ratio of mixed solvent)	Polycarbonate resins	Solvents for polycarbonate resins
12	Polymethylacrylate	Benzene	Polycarbonate from bis phenol A	Methylene chloride
13	Methyl acrylate/ methyl methacrylate (60/40)	Toluene	Polycarbonate from bis phenol A	Methylene chloride
	Methyl acrylate/ styrene (65/35)	Toluene	Polycarbonate from 4,4'-dihydroxy 3,3', 5,5'-tetra-chlorodiphenyl-norbornyl-methane	Methyl-chloroform
14			Polycarbonate from 4,4'-dihydroxy 3,3', 5,5'-tetra-chlorodiphenyl-norbornyl-methane	Chloroform
15	Methyl acrylate/ dimethyl itaconate (50/50)	Toluene/methyl-isobutylketone (60/40)		
16	Methyl methacrylate/ lauryl methacrylate/ acrylic acid (74/24/2)	Toluene	Copolycarbonate from bis phenol A and 4,4'-dihydroxydiphenyl ether	Chloro-benzene
17	Buthyl methacrylate/ methyl methacrylate/ monomethyl itaconate (58/38/4)	Toluene	Polycarbonate from bis phenol A	Trichloro-ethylene
18	Vinyl chloride/ diethyl maleate (30/10)	Toluene/methyl-ethylketone (55/45)	Polycarbonate from bis phenol A	Ethylene chloride
19	Vinyl chloride/ vinyl stearate (70/30)	Toluene/methyl-ethylketone (55/45)	Polycarbonate from bis phenol A	Ethylene chloride
20	Vinyl chloride/ methyl acrylate (65/35)	Toluene/methyl-ethylketone (55/45)	Polycarbonate from bis phenol A	Ethylene chloride
21	Vinyl chloride/ 2-ethyl hexyl acrylate	Toluene/methyl-ethylketone (55/45)	Polycarbonate from bis phenol A	Ethylene chloride
22	Polystyrene	Toluene	Polycarbonate from tetra-chloro-bis-phenol A	Trichloro ethylene
23	Styrene/acrylonitrile (90/10)	Toluene	Polycarbonate from tetra-chloro-bis-phenol A	Trichloro ethylene
24	Styrene/methyl acrylate (60/40)	Toluene	Polycarbonate from tetra-chloro-bis-phenol A	Methylene chloride
25	Styrene/lauryl methacrylate (75/25)	Toluene	Polycarbonate from bis phenol A	Methylene chloride
26	Styrene/butyl acrylate (65/35)	Toluene	Polycarbonate from bis phenol A	Methylene chloride
27	Styrene/vinyl acetate (65/35)	Toluene	Polycarbonate from bis phenol A	Methylene chloride
28	Polyvinylacetate	Benzene/ acetone (50/50)	Polycarbonate from bis phenol A	Methylene chloride
29	Vinyl acetate/ maleic acid (95/5)	Benzene/ acetone (50/50)	Polycarbonate from bis phenol A	Methylene chloride
30	Vinyl acetate/ acrylonitrile (60/40)	Benzene/ acetone (50/50)	Copolycarbonate from bis phenol A and tetrachlorobis-phenol A	Tetra-chloro-ethane

TABLE 4—Continued

Example No.	Linear polymers (Copolymerization mol ratio)	Solvents for Linear polymers (Weight ratio of mixed solvent)	Polycarbonate resins	Solvents for polycarbonate resins
31	Vinylidene chloride/acrylonitrile (75/25)	Toluene/ethyl acetate (50/50)	Copolycarbonate from bisphenol A and tetrachlorobisphenol A	Tetrachloroethane
32	Vinylidene chloride/methyl acrylate (60/40)	Toluene/ethyl acetate (50/50)	Copolycarbonate from bisphenol A and tetrachlorobisphenol A	Tetrachloroethane

What is claimed is:

1. An electrostatic image-recording medium comprising a dielectric layer provided on a conductive base support, said dielectric layer being composed of a linear polymer having a specific volume resistivity of over $10^{12}\Omega\text{-cm}$ that is soluble in a solvent selected from the group consisting of aromatic hydrocarbons, ketones and esters and polycarbonate resin which is soluble in a halogenated hydrocarbon dispersed in said linear polymer.

2. The electrostatic image-recording medium of claim 1 in which said linear polymer is selected from the group consisting of vinyl linear polymers and saturated linear polyesters.

3. The electrostatic image-recording medium of claim 1 in which said linear polymer is selected from the group consisting of polymethylacrylate, polymethylmethacrylate, polyethyl methacrylate, polystyrene, polyvinylchloride, and polyvinylacetate homopolymers and methyl methacrylate/methyl acrylate, methyl methacrylate/butyl methacrylate, methyl methacrylate/ethyl acrylate/monomethyl itaconate, methyl acrylate/styrene, methyl acrylate/dimethyl itaconate, vinylchloride/vinylacetate, vinylidene chloride/acrylonitrile, vinylidene chloride/vinyl chloride and vinyl acetate/crotonic acid, styrene/acrylonitrile, styrene/acrylic acid, styrene/methyl methacrylate, styrene/lauryl methacrylate, styrene/butyl acrylate, styrene/vinyl acetate, methyl acrylate/diethyl itaconate, methyl methacrylate/ α -methylstyrene, methyl methacrylate/lauryl methacrylate/acrylic acid, butyl methacrylate/methyl methacrylate/monomethyl itaconate, vinyl chloride/diethyl maleate, vinyl chloride/vinyl stearate, vinyl chloride/methyl acrylate, vinyl chloride/2-ethyl hexyl acrylate, vinylidene chloride/methyl acrylate, vinyl acetate/maleic acid, vinyl acetate/acrylonitrile copolymers.

4. The electrostatic image-recording medium of claim 1 in which said linear polymer is a saturated polyester selected from the group consisting of ethylene terephthalate/ethyleneisophthalate, ethyleneterephthalate 1,2-bis(4-(β -hydroxyethoxy)phenyl)propaneterephthalate, bis(β -hydroxyethyl)terephthalate 1,2-bis(4-(β -hydroxyethoxy)phenyl)propaneterephthalate, diphenolterephthalate/diphenol isophthalate, 2,2-bis(4-(β -hydroxyethoxy)phenyl)propaneterephthalate.isophthalate/neopentylglycolterephthalate.isophthalate, and 2-methyl-2-propyl-1,3-propanediolterephthalate.isophthalate/ethyleneterephthalate.isophthalate/ethylene-terephthalate.isophthalate copolyesters.

5. The electrostatic image-recording medium of claim 1 in which said polycarbonate resin is selected from the group consisting of a polycarbonate derived from 4,4'-dihydroxydiphenylpropane (bisphenol A), a polycarbonate derived from tetrachlorobisphenol A, a polycarbonate derived from 4,4'-dihydroxydiphenyl norbornyl-methane, a polycarbonate derived from 4,4'-dihydroxy 3,3',5,5'-tetra-chlorodiphenyl-norbornylmethane, a copolycarbonate derived from bisphenol A and tetrachlorobisphenol A, a copolycarbonate derived from bisphenol A and 4,4'-dihydroxyphenylether and a copolycarbonate derived from bisphenol A and 4,4'-dihydroxy diphenyl sulfone.

6. The electrostatic image-recording medium of claim 1, in which said linear polymer is selected from the group consisting of styrene, acrylic, vinylchloride, vinylidenechloride and vinyl acetate polymers.

7. The electrostatic image-recording medium of claim 1, in which said polycarbonate is a derivative prepared from a 4',4-dioxydiarylalkane.

8. A process for producing an electrostatic image-recording medium, which comprises the steps of selecting component A) a linear polymer which is soluble in a solvent selected from the group consisting of aromatic hydrocarbons, ketones and esters and exhibits a volume specific resistance of over $10^{12}\Omega\text{-cm}$ as the main component of a dielectric layer for said medium; selecting Component B) a polycarbonate resin that is soluble in a halogenated hydrocarbon solvent and insoluble in an aromatic hydrocarbon, ketone and ester solvents as the secondary component; dissolving component A in a solvent selected from the group consisting of aromatic hydrocarbons, ketones and esters, dissolving said component B in a halogenated hydrocarbon solvent, mixing the two resulting solutions to thereby disperse said component B as a fine grained gel with high dispersion stability, and coating a conductive base support with this dispersion composition.

9. The process for producing an electrostatic image-recording medium of claim 7, which comprises the step of dissolving the linear polymer in a solvent selected from the group consisting of benzene, toluene, xylene, acetone, methylethylketone, methylisobutylketone, and butyl acetate.

10. The process for producing an electrostatic image-recording medium of claim 7, which comprises the step of dissolving the polycarbonate resin in a solvent selected from the group consisting of methylene chloride, ethylene chloride, monochlorobenzene, chloroform, methylchloroform, trichloroethylene and tetrachloroethane.

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