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ELECTROPHOTOGRAPHIC METHOD OF PREPARING ETCHABLE PRINTING PLATES

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No Drawing. Filed Aug. 14, 1964, Ser. No. 389,802

6 Claims. (Cl. 96—1)

ABSTRACT OF THE DISCLOSURE

The present invention comprises an improved electrophotographic composition containing a photoconductive zinc oxide dispersed in a cross-linking, insulating, film-forming, resinous binder, the binder being selected from a soluble solid epoxy resin of diglycidyl ether of bisphenol-A, a blend of said epoxy resin with an intermediate silicone resin, or a prepolymer of said epoxy resin and said silicone resin.

Exemplary of electrophotographic printing used in the present invention is a process whereby high quality photoengraved printing plates, having image patterns thereon, may be produced, which plates after being etched may be used to reproduce said images, for example, as newspaper print or display advertisements. This process comprises, in general, first providing a static electric charge in a subdued light to a recording element, said element comprising, for example, a prepared photoconductive composition or mixture coated on a back plate material of, for instance, magnesium or zinc base metal. The photoconductive composition may, for example, consist essentially of a sensitizing dye in combination with a photoconductive zinc oxide suspended in a cross-linkable resinous insulating binder, such as SR-82 silicone intermediate resin (commonly used) made and so-designated by the General Electric Company. The element so-charged is then exposed to an illuminated image desired to be reproduced either by, for instance, a contact printing technique or by focusing said image through a lens on the coated plate, thereby to produce a latent electrostatic image. The recording element, within a proper time after charging and exposing, depending on its so-called "dark decay" characteristic or property, defined hereinafter, is then developed and rendered visible. This latter developing operation may comprise a sequence of steps as in liquid developing which includes: (a) contacting said charged and exposed plate with triboelectric catalyst particles, for example, particles suspended in an inert carrier liquid at normal ambient temperatures, for instance, particles of aluminum octanoate suspended in n-heptane; (b) rinsing the so-contacted plate in an inert organic liquid, for example, in a mixture of iso-octane and heptane; (c) heating at an elevated temperature for a suitable varying inverse amount of time to cross-link and otherwise cure the resin areas catalyzed; (d) removing the non-catalyzed, thus non-hardened non-cross-linked resin areas, using a suitable solvent, and (e) removing, for example, by means of an acidic rinse, any surface conversion coating which may be present on the base metal underlying said non-hardened areas. The element now exhibiting a visible image pattern, and exposed bare metal

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in the non-image areas, may then be subjected to an etching treatment, preferably, to the recently developed and well known powderless etching process.

In addition to the liquid developing technique, as described immediately above, the charged-exposed plate may also be developed by means of a powder cloud, a cascade, or magnetic brush technique as known and practiced by those skilled in the art.

Though by means of the electrophotographic process described hereinbefore acceptable etchable photoengraving plates may be produced, they suffer a number of disadvantages which render them substantially commercially unacceptable. Among these disadvantages is that the silicone containing coatings are penetrable by the acid etching bath, such as nitric acid frequently used for etching magnesium, used in the powderless etching process causing softening of said coating. In addition, they are somewhat leached out by said bath. Moreover, the silicone containing coatings, though providing good flowability for application on the plate are poorly adherent to bare metal, and thus require a surface treatment such as application of a chromate conversion layer between said coating and plate for proper adhesion. Accordingly, a surface conversion layer must initially be applied as an acid etch resist and as a nonmetal conversion coating to protect and render the metal plate adherent. This requires lengthy extra steps in the process, including materials and equipment, not to mention the subsequent step of removing said layer so as to expose the bare metal for etching.

Another disadvantage of the silicone containing coatings is that they have poor resistance to mechanical abrasion. Extreme care must be exercised, therefore, even after curing the coating to avoid damage to the plate during processing lest it be ruined, thus requiring making another at additional cost and time.

An object of the present invention, therefore, is to provide a new and novel photoconductive composition for use in electrophotographic printing which substantially avoids the disadvantages and difficulties described hereinbefore.

A further object of the present invention is to provide an improved cross-linkable photoconductive composition for application as a coating on metal plates, which coating is highly adherent to bare metal, solvent and etch resistant, is hard, thus subject to less damage due to mechanical abrasion during handling, shipping, and processing, has a fast light decay characteristic and a slow dark decay characteristic, and which takes on and retains a high electrostatic charge.

The term "dark decay" as used herein refers to the characteristic or property of an electrostatically charged photoconductive recording element of losing said charge in the dark or in a subdued appropriately colored light, as a function of time, without incurring detrimental loss of said charge below an effective level needed for electrophotographic reproduction purposes.

The term "light decay" refers to the characteristic or property of the recording element to rapidly dissipate an electrostatic charge to a sufficiently low level upon being exposed to a given intensity of electromagnetic radiation so as to permit formation of a sharp latent electrostatic image for further developing.

Other objects and advantages will become apparent from the following description of the invention.

In general, the novel photoconductive composition of the present invention comprises by weight from about 40 to about 90 percent, and preferably from about 60 to about 70 percent, of a photoconductive zinc oxide and from about 60 to about 10 percent by weight of a resinous binder material, said binder material containing from about 15 to about 100 percent of a soluble solid epoxy resin of diglycidyl ether of bisphenol-A, and, if desired, an effective amount based on the weight of the total composition of one or more sensitizing dyes to render the zinc oxide more responsive or particularly responsive to light of varying wave lengths.

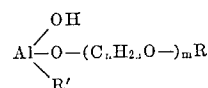
Preferably epoxy resins as described with epoxide equivalent weights of from about 250 to 5500 are employed. Suitable coatings are obtained both with the epoxy resin alone as well as with blends of one or more of the present epoxy binders individually with one or more silicone intermediate resins or as a prepolymer of the epoxy and one or more of said silicone intermediate resins, such as, for example, in a blend with or as a prepolymer of the hereinbefore mentioned SR-82 resin and the epoxy. Such combinations provide flowability to the composition with respect to application of the composition on plates. Said silicone resin can either be straight chained or cyclic in structure. The silicone content in the blend or in the prepolymer will preferably be a binder amount within the range of from about 15 to about 75 percent by weight of the total weight of binder material used in the composition and may be as high as 85 percent. Upon being catalyzed and cured both resins will copolymerize or cross-link together as described hereinbefore similarly as will the individual resins.

The zinc oxide which may be used in the present novel photoconductive composition is a photoconductive zinc oxide which is substantially electrically nonconductive in the dark and which exhibits a surface photoconductivity of at least a minimum level sufficient for practical use in the composition. An example of such a photoconductive zinc oxide is Florence Green Seal No. 8 zinc oxide made by New Jersey Zinc, Inc.

Cross-linking promoting catalysts found which may be used to cross-link or promote cross-linking of the epoxy resins, epoxy containing prepolymers and epoxy resin blends as binders used in the present invention include, for example, aluminum fatty acid salts; alkoxy aluminum fatty acid salts, for example, dimethoxy aluminum octanoate, diethoxy aluminum octanoate; alkoxy ether aluminum fatty acid salts, for example, aluminum ethoxy ethyl ether octanoate, aluminum ethoxy methyl ether octanoate, and other organo metallic salts of carboxylic acids. Dimethoxy aluminum octanoate has been found to be a particularly good catalyst.

Generally, these alkoxy aluminum fatty acid catalyst salts are those wherein the alkoxy group of said salt contains from 1 to 10, inclusive, carbon atoms, and the fatty acid radical thereof contains from 6 to 18 carbon atoms, inclusive. They may be prepared by reacting a primary alcohol with an aluminum fatty acid salt under alkaline condition, said alcohol having from 1 to 10 carbon atoms, inclusive, and the fatty acid radical of said salt having from 6 to 18 carbon atoms, inclusive, at a temperature of from about 20° to about 250° C., thereby forming the alkoxy salt, whereupon, said alkoxy salt is separated from the reaction mass and thereafter normally washed. The alkoxy aluminum fatty acid salts may also be prepared by reacting an alcohol-soluble aluminum inorganic salt with a primary alcohol having said requisite number of carbon atoms, to form an ethoxy aluminum salt, then admixing an aliphatic fatty acid therewith, said acid also having the requisite number of carbon atoms, neutralizing the solution so-formed, thereby forming the alkoxy aluminum fatty acid salt as a precipitate, whereupon, said precipitate is separated from the liquid phase and thereafter normally washed.

The alkoxy ether aluminum fatty acid catalyst salts generally conform to the structure



wherein R' represents a fatty acid radical containing from 6 to 12, inclusive, carbon atoms, n represents an integer of from 2 to 3, inclusive, m represents an integer of from 1 to 3, inclusive, and R represents an alkyl radical containing from 1 to 4 carbon atoms, inclusive. They may be prepared by reacting a primary straight chained glycol ether with an aluminum fatty acid salt under alkaline condition, the fatty acid radical of said salt having from 6 to 12 carbon atoms, inclusive, thereby forming the corresponding alkoxy ether aluminum fatty acid salt, whereupon, said alkoxy ether salt is separated from the reaction mass and normally washed.

These novel epoxy and epoxy-silicone-blend photoconductive compositions have excellent electrical properties, are highly solvent resistant, when cured, and are essentially not penetrated nor softened and are not leached out by the acid etching baths aforesaid. Moreover, said compositions are highly adherent to the bare base metal plate, thus they eliminate the need for the heretofore required surface conversion and etch resist layer between said plate and coating. In addition, unlike a similar composition containing only silicone binders, they are hard and act very effectively to resist abrasion during handling after being cured.

In preparing the present epoxy resin-containing photoconductive compositions wherein the epoxy is the only resin used, as a binder, ordinarily the photoconductive zinc oxide is milled, for example, in a ball mill in the presence of a fluidizing amount of one or more fluidizing agents, for instance, ethylene glycol ethyl ether, for a period of from 3 to 72 hours to reduce the agglomerate or particle of said zinc oxide to a submicron size as a minimum and up to 100 microns, provided the particles are uniform in size. Preferably, the milling time will be from about 4 to about 18 hours, with an optimum milling time being about 6 hours. Such milling may be done either in the presence or absence of the sensitizing dye, and it is preferable to add the epoxy binder not more than about 5 to 10 minutes prior to termination of milling. The viscosity of the mix during milling should be within the range of from about 2500 to about 11,000 centipoises, preferably about 5000 to about 6000 centipoises. Therefore, the amount of fluidizer needed to obtain said viscosity will be used accordingly. For small batches, a Waring blender may be used for milling the zinc oxide. Accordingly, when the blender is used, much shorter milling times are required, for example, times from 5 to 15 minutes are usually sufficient to break up the zinc oxide agglomerates. Normally during milling the sensitizing dye such as, for example, a disodium fluorescein salt, which is conventionally known and used for this purpose, is added. Other such dyes may also be used in amounts as may readily be predetermined by those skilled in the art, depending on the dye used and spectral response desired. Upon being preferably so-milled, the composition can be applied immediately or be held in semi-quiescence for from about 4 to 16 hours while being gently agitated to maintain uniformity and to obtain a stabilized viscosity for spraying of, for example, from about 20 to about 200 centipoises. Thereafter, it is preferably filtered through a 325 to 500 mesh screen and then applied to the previously prepared base plate by, for example, spraying or flow coating to, for example, a film thickness of from about 0.3 to about 2 mills.

When milling zinc oxide to which an epoxy-silicone blend as a binder is to be added, however, this blend must be added in a binder amount as specified hereinbefore not

more than about 5 to 10 minutes prior to termination of milling. If added earlier, detrimental encapsulation of the zinc oxide particles may occur thereby adversely affecting its photoconductivity. The term "milling" as used herein refers to a milling action, as in a ball or rod mill, grinding, abrading, or other means or action of working the zinc oxide particles and agglomerates to obtain the proper size, whereas, the term "mixing" as used herein refers to the action of agitating or otherwise mechanically moving one or more materials of the composition to obtain a uniform mixture and/or consistency.

Organic liquid fluidizing agents for milling the zinc oxide which may be used other than the one hereinbefore mentioned ethylene glycol ethyl ether include, for example, a fluidizing amount of one or more fluidizing materials selected from the group consisting of an organic liquid glycol, for example, ethylene glycol, dipropylene glycol; an anhydrous alcohol, for example, ethyl alcohol, n-decyl alcohol; and ether glycol, for example, ethylene glycol ethyl ether, propylene glycol methyl ether; and an ether alcohol, for example, 4-methoxy 4-methyl pentanol-2 (Pent-o-Xol), 2-ethoxy ethanol-1 (Cellosolve).

In addition to the organic liquid fluidizers prescribed for use hereinbefore, fluidizing quantities within the range of from about 0.01 percent by weight to about 3.0 percent by weight, preferably 0.01 to 0.2 percent, may also be used of a fluidizing resin selected from the group consisting of (a) an intermediate silicone resin having one or more reactive hydroxyls and characterized by either a straight or cyclic chain, for example, the SR-82 silicone resin aforesaid, or, Dow Corning Z6018 silicone intermediate resin and (b) an epoxy resin containing one or more reactive hydroxyls, for example, an epoxy diglycidyl ether bisphenol-A, or, an epoxidized polyolefin. These and other resins, such as, for example, alkyd resins (polyester type) and polyglycols, in such fluidizing quantities (a few drops), together with an inert diluent, such as, for example, methyl ethyl ketone, toluene, or preferably cellosolve acetate, to reduce the mix viscosity, act very effectively as fluidizers and, as aforesaid, cause no detrimental amount of encapsulation of the zinc oxide.

The term "binder quantities of resin," or an equivalent or similar term, as used herein, refers to quantities of resin added for the purpose only as a binder for the zinc oxide particles and for the photoconductive composition in general (as opposed to a fluidizing purpose).

When employing the resins specified above in fluidizing amounts for dispersing the zinc oxide particles, it is normally necessary to incorporate into the mixture an inert diluent to obtain a proper mix viscosity for milling. A proper viscosity has been found to be, for example, one within the range of from about 2500 to about 11,000 centipoises, preferably about 5000 centipoises. Suitable diluents for use in the present invention include, for example, xylene, toluene, Pent-o-Xol, and ethylene glycol ethyl ether, depending on the fluidizer being used.

Use of a diluent for proper viscosity during mixing may also be desirable when using one of the non-resin fluidizers, that is, when using one of the aforesaid organic liquid fluidizers specified above, which has in inherent high viscosity (that is, too high for proper milling). In this case, a less viscous organic liquid fluidizer may be admixed therewith, or, a non-fluidizing inert diluent such as, for example, methyl ethyl ketone or toluene may be added. The less viscous organic liquid fluidizers, of course, such as, for example, Pent-o-Xol, inherently serve as their own diluent.

Once formulated, applied to the base plate, electrostatically charged, exposed to an illuminated image and contacted with a cross-linking promoting catalyst as aforesaid, the epoxy binder or epoxy-silicone resin blend or prepolymer is cured (cross-linked) by heating to a temperature of from about 400° to about 600° F. for an inverse period of time of from about 20 to about 3 minutes, such as, for example, at 500° F. for 5 minutes, the opti-

mum temperature and time combination being readily determined by one skilled in the art.

The following examples further illustrate the present novel photoconductive compositions and method of preparation. They are not to be construed, however, as limiting the invention thereto.

EXAMPLE I

A photoconductive composition in accordance with the present invention was prepared as follows: 86.4 grams of Florence Green Seal No. 8 zinc oxide together with 0.96 cc. of a stock solution comprising 2.08 grams of fluorescein disodium salt in 100 cc. of methyl alcohol was milled in 100 cc. of Dowanol EE (ethylene glycol ethyl ether) for 10 minutes in a Waring blender operating at a maximum speed. 43.6 grams of epoxy resin DER-661 (diglycidyl ether of bisphenol-A having an epoxide equivalent weight of about 475-575) in Dowanol EE was then added. Thereafter the mixture was blended for one hour with mild agitation and then applied to a clean bare metal surface of a magnesium photoengraving sheet by a flow coating technique. This coating was allowed to dry for about 2 hours at 75° C. So-dried the coating was "light rested" by storage in the dark for about 48 hours, whereupon, a negative electrostatic charge was applied by means of a corona discharge wire to a level of about 500 volts. A latent electrostatic image was then established thereon by contact exposure to a transparency for 12 seconds using a light of 15 foot candles intensity. The latent image was then contacted with a cross-linking promoting catalyst, dimethoxy aluminum octanoate, suspended in inert hydrocarbon carrying liquid, rinsed, and then heated at 200° C. for about 15 minutes to cross-link the epoxy resin. Upon being cooled, the areas which were not cross-linked, thus not hardened, were removed by scrubbing with a suitable solvent, such as propylene glycol methyl ether. The plate was then subjected to the powderless etching process.

During the above sequence, both the light and dark decay characteristics were determined by means of coupon samples and it was found that the plate, after being light rested as aforesaid and then charged to a level of about 620 volts, was reduced while standing in the dark to a level of about 580 volts after about 60 seconds. Similarly, upon exposing said coupon samples which had been charged initially to about 620 volts, the voltage was reduced to about 10 volts upon being exposed to a 0.8 foot candle light after 30 seconds.

After curing (heating and cross-linking) the present coatings exhibited amazing resistance to scuffing and abrasion in general. Moreover, the coatings were tightly adherent even though the base metal photoengraving sheet had not first been provided with a chromate layer or coating. In addition, it was determined that little, if any, penetration of the coating by the acid etching bath (nitric) had occurred during the powderless etching of the coated plate.

EXAMPLE II

In this example prepolymers of epoxy and silicone resins were prepared for use in the present novel photoconductive coatings or compositions. These prepolymers were made from resin mixtures by reacting the individual resins together in the indicated proportions and conditions indicated in Table I below at a 60 percent solids level in various aromatic hydrocarbon solvents at a temperature within the range of from about 110° C. to about 120° C. The degree of reaction was indicated by an increase in viscosity. Z6018 resin used in preparing these prepolymers is a cyclic chained silicone resin and the DC 840 resin is a straight chained intermediate silicone resin, both made by the Dow Corning Corp. The DER epoxy designations are defined hereinafter.

TABLE I.—REACTION CONDITION FOR EPOXY-SILICONE PREPOLYMERS

Sample No.	Epoxy	Silicone	Solvent diluent	Reaction	
				Temperature, ° C.	Time, hours
(1)-----	50 pts. DER 661-----	50 pts. Z6018-----	Xylene+toluene-----	110	18
(2)-----	50 pts. DER 661-----	50 pts. SR-82-----	do-----	120	15
(3)-----	50 pts. DER 661-----	50 pts. DC-840-----	Toluene-----	120	15
(4)-----	20 pts. DER 661----- 10 pts. DER 332-----	70 pts. SR-82-----	Xylene+toluene-----	120	15

Table I sets forth the reaction conditions employed. So-prepared, these prepolymers were then added as binders for the zinc oxide in the present photoconductive composition. A typical photoconductive composition prepared for milling is as follows:

Green Seal No. 8 zinc oxide -----grams-- 65
 Dowanol EE -----cc-- 85
 A 2 percent fluorescein disodium salt sensitizing dye
 in methyl alcohol -----cc-- 0.7
 Indicated prepolymer solution -----grams-- 54

The zinc oxide, Dowanol EE and dye were milled or ground in a Waring blender for 10 minutes at full line voltage (110). Magnesium tabs and also some larger plates were flow coated with the various mixes prepared, whereupon photoconductivity measurements (light and dark decay values) were made using a dynamic-capacitor electrometer (the electrometer data are tabulated in Table II, the sample numbers corresponding to those of Table I). These coatings exhibited a good light and dark decay character and gave cured images which were tightly adherent highly solvent resistant and also resistant to acid etching baths. Furthermore, these coatings exhibited outstanding resistance to mechanical abrasion.

TABLE II.—PHOTOCONDUCTIVITY DATA ON EPOXY-SILICONE PREPOLYMER PE COATINGS

Sample No.	Peak Voltage	Dark Decay Voltages at—		Photo Decay Voltages at—	
		30"	60"	10"	20"
(1)-----	500+	450	355	15	<10
(2)-----	500+	315	255	<10	-----
(3)-----	500+	375	335	<10	-----
(4)-----	500+	450	365	<10	-----

EXAMPLE III

To illustrate the use of simple blends (not prepolymers) of the individual epoxy resins, identified below, with the

dye had been added. Again metal tabs were flow-coated with the various mixes and photoconductivity measurements made by use of the aforesaid electrometer after the coated plates had been dried for about 2 hours at 75° C., light rested for 48 hours, then negatively charged to the levels indicated in Table III by a corona discharge wire. The charged plates were then exposed by contact to a transparency image for 12 seconds using a 15 foot candle light. The latent images formed were then contacted with dimethoxy aluminum octanoate particle suspended in an inert carrier liquid for a few seconds then heated at 200° C. for about 15 minutes. The non-cured background areas were then removed by a suitable solvent and the plate etched.

In addition to the aforesaid photoconductivity tests, the plates were also examined for adhesion, solvent and etching bath resistance and mechanical abrasion properties. The results of all these tests are set forth in Table III below.

The epoxy resins used in this and previous examples which are more fully identified as follows:

DER 661: An epoxy resin of diglycidyl ether of bisphenol-A, having an epoxide equivalent weight of from 475 to 575.

DER 664: An epoxy resin of diglycidyl ether of bisphenol-A, having an epoxide equivalent weight of from 875 to 975.

DER 332: An epoxy resin of diglycidyl ether of bisphenol-A, having an epoxide equivalent weight of from 172 to 178.

DER 667: An epoxy resin of diglycidyl ether of bisphenol-A, having an epoxide equivalent weight of from 1600 to 2000.

It can be seen, therefore, from Table III that blends of epoxy and silicone resins when used as such in photoconductive composition with zinc oxide produce high quality coatings in accordance with the present invention, particularly those containing greater than 50 percent epoxy resin.

TABLE III.—ELECTROMETER DATA ON EPOXY, EPOXY SILICONE BINDERS FOR ZINC OXIDE

Sample No.	Epoxy Content*	Peak Voltage	Dark Decay Voltages		Light Decay Voltages			Etching Bath Resistance	Solvent Resistance	Adhesion to Bare Metal
			30"	60"	10"	20"	30"			
Control----	(100% SR-82)-----	400	340	320	15	<10	-----	Poor-----	Poor-----	Poor.
(1)-----	10% DER-661-----	500	465	440	12	<10	-----	Better-----	Better-----	Do.
(2)-----	10% DER-664-----	500	485	470	145	<10	-----	do-----	do-----	Do.
(3)-----	50% DER-661-----	420	360	340	<10	-----	-----	Good-----	Good-----	Good.
(4)-----	75% DER-661-----	>500	480	455	<10	<10	-----	Excellent--	Excellent--	Excellent.
(5)-----	75% DER-664-----	435	375	360	<10	-----	-----	do-----	do-----	Do.
(6)-----	75% DER-667-----	430	355	335	<10	-----	-----	do-----	do-----	Do.
(7)-----	100% DER-661-----	>500	>500	495	380	120	<10	do-----	do-----	Do.
(8)-----	100% DER-664-----	390	365	350	<10	<10	-----	do-----	do-----	Do.
(9)-----	100% DER-667-----	455	370	325	15	<10	-----	do-----	do-----	Do.

*Balance being silicone SR-82 resin.

silicone resins as binders for use in the present novel photoconductive composition, various proportions of the two resins were mixed to uniformity and then added to Florence Green Seal No. 8 zinc oxide which had been properly milled in ethylene glycol ethyl ether in a Waring blender for about 10 minutes, also to which fluorescein

The present invention may be modified or changed without departing from the spirit or scope thereof and it is understood that I limit myself only as defined in the appended claims.

I claim:

1. In an electrophotographic method of preparing etch-

able printing plates employing a photoconductive composition comprising a photoconductive zinc oxide suspended in a cross-linkable resinous insulating film forming binder as a recording element, wherein said element is electrostatically charged, exposed to an illuminated image, thereby forming an electrostatic image thereon, which is then developed by contacting and subsequently heating said image with a catalyst material to promote cross-linking of said resinous binder thereby to form an etch resist image pattern; the improvement which comprises employing as the binder in the photoconductive composition a resinous material selected from the group or resinous materials consisting of (a) a soluble solid epoxy resin of diglycidyl ether of bisphenol-A, (b) a substantially physical blend of said epoxy resin with an intermediate silicone resin, and (c) a prepolymer of said epoxy resin with said silicone resin, the amount of silicone resin present in said blend and said prepolymer being within the range of from about 15 to about 90 percent.

2. The improvement of claim 1 wherein the epoxy resin has an epoxide equivalent weight of from about 475 to about 2000.

3. The improvement of claim 1 wherein from 15 to about 75 percent of said silicone resin is present in said blend and said prepolymer of the epoxy and silicone resins.

4. The improvement of claim 1 wherein the photoconductive composition includes a sensitizing dye to vary the spectral response of the zinc oxide component thereof.

5. The improvement of claim 1 wherein the catalyst material employed to provide cross-linking of the resinous epoxy, epoxy-silicone blends, and epoxy-silicone prepolymers is selected from the group of catalyst consisting of alkoxy aluminum fatty acid salts, and alkoxy ether aluminum fatty acid salts.

6. The improvement of claim 5 wherein the catalyst material is dimethoxy aluminum octanoate.

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