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Levinos

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[54] **PRODUCTION OF LUMINESCENT SCREENS**

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Related U.S. Application Data

[63] Continuation of Ser. No. 679,617, Nov. 1, 1967, abandoned.

[52] **U.S. Cl.**..... **117/33.5 CM,** 96/1 E, 96/36.1, 117/93.31, 117/161 UA, 117/161 UB, 117/161 UC, 117/161 UE, 117/161 UF, 117/161 UN, 117/161 UZ

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[58] **Field of Search**..... 117/93.31, 33.5 CM, 117/161 UA, 161 UB, 161 UC, 161 UE; 96/36.1, 1 E

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[57] **ABSTRACT**

Process for the production of luminescent screens for color television tubes, the improvement comprising the use of light-insensitive ethylenically unsaturated vinyl compounds as the binder material, said compounds being capable of undergoing a hardening action when subjected to corpuscular radiation.

5 Claims, No Drawings

PRODUCTION OF LUMINESCENT SCREENS

This application is a streamlined continuation of prior co-pending application Ser. No. 679,617, filed Nov. 1, 1967, and now abandoned.

The present invention relates in general to the manufacture of color television picture tubes and in particular to the provision of improved compositions and processing for such purposes.

As is well known, phosphor glass screens of the type commonly employed in the fabrication of color television picture tubes comprise a plate provided with finely discrete patterns of three different phosphors each of which is capable of emitting radiation of a different primary color, i.e., red, green and blue. In general, tubes of this nature are constructed in such fashion that a thin perforated metal mask is mounted parallel to the screen and a short distance away from the screen toward the gun end of the tube, such metal mask being provided with a concatenation of holes. Each of the holes provided in the metal mask corresponds to each of the primary colors, i.e., is positioned to illuminate a trio of red, green and blue emitting phosphor dots comprising a single unit of the aggregate phosphor dot pattern carried by the luminescent screen. In addition, three electron guns are mounted symmetrically about the axis of the tube. Each of the gun, mask and dotted screen elements are positioned in such manner that the electron beam from each gun is directed through the holes in the mask so as to strike phosphor dots of one primary color only.

Methods for the production of color television picture tubes of the aperture mask type are legion being extensively described in the prior art both patent and otherwise. For purposes of general classification, such methods are acknowledged to fall within one of three categories, namely, those based upon photographic reproduction techniques and silk screen printing respectively as well as numerous other processes currently considered to be of lesser commercial importance, e.g., letterpress printing, electrostatic printing, methods involving the settling of phosphors through masks, etc.

Although the methodology thus far promulgated in regard to color television tube manufacture is found in the vast majority of instances to provide satisfactory results, certain limitations which inhere in the very nature of such processing have nevertheless been confronted which tend to circumscribe severely the tube manufacture's scope of operation with respect to for example, selection of the materials essential to the implementation of such methods, the processing conditions necessary for optimum performance, etc. For example, it has been ascertained that the silk screen process is limited, for efficacious practice, to those applications wherein the plate employed as the support for the phosphor screen pattern is absolutely flat or planar. Consequently, processes of this type are sustantially inapplicable as such in those instances involving the use of a plate element of arcuate or otherwise irregular configuration. The gravity of this particular limitation becomes acutely evident when it is realized that much of the industrial endeavor relating to the manufacture of color television tubes is specifically concerned with the fabrication of non-planar picture tube surfaces and particularly when the latter is of relatively large size. Color television picture tube technology has established to a reasonable certainity that picture tubes of arcuate as distinguished from planar configuration provide a much more highly efficient and practical tube structure. However, prior industrial efforts to extend the applicability of the silk-screen picture tube manufacturing process for the production of curved television tube surfaces have for the most part met with but marginal success. Invariably, resort to complex if not highly expensive ramifications, modifications, etc. of the basic technique is made necessary in order to implement such processing with any degree of efficacy.

In contradistinction, color television picture tube manufacturing based upon photographic reproduction methods has met with a fairly impressive measure of commercial success. In general, such methods are implemented by the utilization of a photosensitive organic carrier or binder which, in the presence of a suitable catalyst material, undergoes a change in solubility characteristics as a direct result of actinic exposure. Such carriers or binders are often referred to in the art as "colloid" carriers, the quoted term connoting resinous materials of synthetic derivation or natural origin, with typical representatives including polyvinyl alcohol, gelatin and the like. The requisite level of light-sensitivity is ordinarily imparted to the binder component by the incorporation of a suitable sensitizing agent such as potassium or ammonium dichromate. The binder material thus sensitized is thereafter applied to the inside surface of the television picture tube viewing panel by any one of several conventional coating techniques, e.g., flowing, spraying, whirling, etc. Any excess coating material can thereafter be readily removed by draining or spinning in a whirl coater until a uniform and even surface is obtained. It will be understood that the selection of a particular coating technique may well obviate any necessity for the use of auxiliary expedients whereby to obtain an even coating; thus, in the case of spray coating, the removal of excess light-sensitive binder may be easily accomplished by merely controlling the quantity of coating deposited by the spray applicator whereas uniformity of coating application may be controlled by judicious selection of the spray pattern. Upon completion of the coating operation and prior to drying of the coating thus deposited, i.e., while such coating remains in a moist or tacky state, a uniform screen of dry powered luminescent phosphor, e.g., green phosphor of the type commonly used, is sprayed or otherwise deposited upon the tacky, radiation energy-sensitive layer. The phosphor-containing coating is then dried by conventional means and thereupon exposed to a radiant energy source through a conventional shadow mask. The latent-image dot pattern thus laid down represents the illumination locus or excitation area for one of the three primary colors, i.e., red, green or blue corresponding to one of the three cathode emitters of the tricolor tube. The final step involved in the formation of the phosphor pattern comprises the development operation wherein the entire surface of the panel is subjected to a wash-out operation, i.e., washed with a developing fluid such as deionized water, this treatment serving to remove the unhardened or non-exposed areas of the coating while permitting the exposed or hardened areas to remain intact. The aforedescribed chronology of operations is then repeated in its entirety for each of the remaining primary color aspects. In this manner there is obtained a complete tricolor pattern. As will be recognized, the dot patterns corresponding to the remaining primary color aspects, in this case the blue and red additive primary color aspects, conform

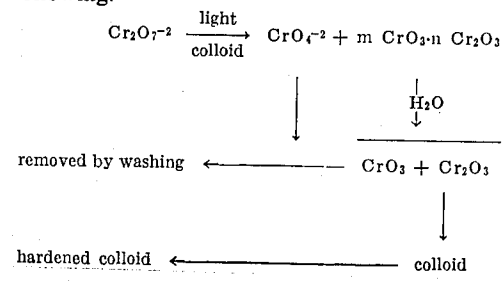
in arrangement, i.e., distribution, pattern, etc., to the blue and red cathode emitters respectively of the tricolor tube.

It will be appreciated of course that a number of ramifications to the aforedescribed basic procedure are exploited on a commercial scale. For example, one such ramification involves as an essential expedient the actinic exposure of the radiation-sensitive coating prior to drying, i.e., while such coating remains in a tacky condition. Upon completion of the exposure, a uniform screen of dry powdered phosphor is sprayed or otherwise deposited upon the coating surface. Again, the terminal point in the processing would comprise the development operation wherein the exposed and sprayed surface is treated with deionized water or other suitable solution whereby to effect physical removal of the unexposed, unhardened coating areas. The entire sequence of operations would then be repeated for each of the remaining primary color aspects in the manner hereinbefore described.

A still further ramification to the aforedescribed basic procedure and one currently enjoying relatively wide-spread commercial exploitation, involves as a signal feature, the utilization of the phosphor material in the form of a mixture, e.g., slurry or dispersion in the binder material. According to such method, the phosphor is provided in the form of a preliminary slurry or dispersion with the binder material, admixing being effected according to conventional techniques, the film-forming composition being thereafter applied to the inside surface of the picture tube panel by flowing or whirling. Following removal of excess coating by draining or spinning the coated layer thus obtained is exposed and developed in the manner previously delineated, the involved sequence of operation being repeated for each of the primary color aspects.

The processing subsequent to the laying down of the tricolor phosphor pattern and incidental to the obtention of a final color television picture tube unit is for the most part involving, for example, the usual steps of lacquering, aluminizing, inserting the shadow mask, sealing both sections of the tube to form an integral unit and finally, evacuating and baking at a temperature sufficient to burn away the binder.

Despite the fact that color television picture tube manufacturing operations of the aforedescribed type have met with a significant measure of commercial success, certain disadvantages and shortcomings have nevertheless been encountered in practice which tend to detract significantly from their commercial feasibility and desirability. Perhaps the most serious objection relates to the nature of the sensitizing material employed for purposes of imparting the requisite spectral response to the composition. To a great extent, commercial operations, as presently embodied, rely almost invariably upon the use of alkali metal dichromate sensitizing agents in combination with polyvinyl alcohol resin binders for use in the manufacture of luminescent screens for color television tubes. However, prior attempts to produce luminescent screens possessed of optimum luminosity, brilliance, etc. have, practically without exception been vitiated due to the fact that residual chromium, in significant quantities, remains in the light-hardened areas of the coating. Unless removed at some phase of screen manufacture, e.g., development, wash-out, etc., such fugitive chromium remains present in the form of an oxide the latter resulting in a serious loss of brilliance of the phosphor material on electronic excitation. Such a situation is of course of critical import since it directly affects the viewing quality of the picture tube. The deleterious effects thus resulting are further aggravated by the fact that the point-to-point density distribution of the fugitive chromium may vary significantly with the concomitant result that not only is picture contrast seriously impaired, but more importantly, the capacity of the luminescent screen to accurately reflect the color component values directly attributable to electronic excitation is seriously reduced. Without intending to be bound by any theory, the following hypotheses have nevertheless been postulated in explanation of the foregoing situation. Eder, in an article published many years ago relating to quantitative studies of bichromated gelatin, concluded that bichromates in the presence of oxidizable organic matter tend to undergo decomposition according to a series of relatively complicated reactions resulting in the formation of neutral chromates as well as a chromic chromate, $m\ CrO_3.n\ Cr_2O_3$ wherein m and n represent numerical coefficients, the latter compound further decomposing into chromic acid and green chromium oxide as a result of subsequent washing. The neutral chromate and chromic acid are, according to theoretical exposition, carried away by the water employed during the wash-out step. The chromium oxide, however, combines with the carrier or binder resulting in the formation of an insoluble complex, the reactions hypothesized therefor being the following:



According to further evidence gathered by Popovitski, the product was identified as $4\ Cr_2O_3.\ 3\ CrO_3$ which was presumed to result according to the following reactions:

$16\ K_2Cr_2O_7 \rightarrow 16\ K_2CrO_4 + 8\ Cr_2O_3 + 12\ O_2\ 6\ K_2Cr_2O_7 \rightarrow 6\ K_2CrO_4 + 6\ CrO_3.$

Regardless of the reaction mechanism actually responsible for the presence of fugitive chromium, there is ample evidence to indicate that approximately 19 percent of the total dichromate salt sensitizer employed in the initial charge remains in the cross-linked polyvinyl alcohol in the form of the insoluble chromic oxide. In addition, it has been estimated that almost 22 percent of the dichromate salt sensitizer remains behind as the insoluble chromic oxide in those instances wherein ammonium dichromate is employed as the photosensitizer. The use of light-sensitive catalysts presents the further disadvantage that a considerable cost increment results since such materials are invariably quite expensive.

Thus, in an effort to circumvent theor foregoing problems, the use of binder compositions sensitive to radiation of corpuscular nature, e.g., electron beam, has been suggested for use in color television tube manufacture. The corpuscular radiation serves to provide the requisite quantity of energy necessary to effect in-

solubilization of the binder component, e.g., by cross-linking of organic polymeric constituents, polymerization of monomeric constituents, etc. Methods of this type although ameliorating somewhat the problems attendant upon the use of photosensitive binder compositions nevertheless pose rather serious problems to the processor, such problems finding their genesis in the inherent light-sensitivity of the resin component.

The practical significance of the foregoing will be made readily manifest in the following description. In those methods of color television tube manufacture wherein the red, green and blue phosphors are initially provided in the binder composition to be subjected to electron beam exposure, it is of course imperative that the radiant emissions of each of the phosphors be inconsequential, i.e., that the composition be insensitive to the light emitted by such phosphors. This is essential in order to assure that the totality of hardening action is attributable solely to the direct effects of the exposure beam. Any departure from such condition would involve as an unavoidable consequence the insolubilization of binder in non-image areas and/or excessive hardening due to overexposure. Thus, it has been determined that the polymeric binder materials thus far provided in the art exhibit an appreciable sensitivity to the radiant emissions of the phosphor particles, the blue phosphor being particularly offensive in this regard since its locus of emissions emanates from the violet-blue portion of the spectrum. The foregoing thus precludes the use of the blue-emitting phosphor in the binder composition prior to electron beam exposure since the light emitted by the blue phosphor upon electron beam excitation would cause non-purposive and inadvertent exposure effects, the latter, in all probability, resulting in undesired growth in dot dimension. Continued exposure would of course aggravate this tendency. Thus, as a practical necessity, the use of binder compositions possessed of appreciable light-sensitivity imposes the burdensome restriction that electron beam exposure be carried out in the absence of phosphor, the latter being applied in a separate operation subsequent to exposure. Processing is of course encumbered while the economic consequences involved may well be prohibitive.

A further disadvantage characterizing the methods heretofore provided in the art inheres in the nature of the resist-forming material. Thus, the ethylenically unsaturated compounds heretofore proposed for such use are adapted for solvent removal techniques wherein the solvent comprises an organic material. This, of course, poses a significant disadvantage since such solvent materials are invariably costly, difficult to handle, store, etc. and very often present considerable health hazards to personnel. Consequently, processing is correspondingly burdened in view of the special precautions which must necessarily be excercised with regard to the use of organic solvent media.

In an effort to overcome or otherwise alleviate the foregoing and related disadvantages, considerable industrial activity has centered around the research and development of more effective methods, materials, etc. for the production of luminescent screens for color television picture tubes. Although much in the way of meritorious achievement has characterized the efforts thus far expended in this regard, the problems surrounding the obtention of luminescent screens having the desired degree of brilliance, luminosity, etc. continue to challenge tube-manufacturing technology.

In accordance with the discovery forming the basis of the present invention, it has been ascertained that the use of a relatively delimited class of ethylenically unsaturated organic material having predetermined spectral sensitivity characteristics and capable of undergoing insolubilization when subjected to corpuscular radiation makes possible optimum realization of the manifold advantages inherent in resist forming techniques based upon the use of corpuscular radiation when applied to color television tube manufacture, while eliminating the problems associated with spurious hardening effects typifying the procedures heretofore provided in the art.

Thus, a primary object of the present invention resides in the provision of compositions and processing uniquely and beneficially adapted for use in connection with the manufacture of luminescent tricolor screens for color television picture tubes wherein the foregoing and related disadvantages are eliminated or at least mitigated to a substantial extent.

Another object of the present invention resides in the provision of a process for the preparation of color television tubes wherein problems associated with residual metal contamination are eliminated.

Yet another object of the present invention resides in the provision of a process for the preparation of color television tubes capable or providing sharp dot patterns of excellent brightness.

A further object of the present invention resides in the provision of a process for the preparation of luminescent screens for color television tubes comprising polymeric resists and wherein any necessity for the utilization of organic solvent media in developing the resist image is completely obviated.

A still further object of the present invention resides in the provision of a process for color television tube manufacture capable of expeditious implementation and wherein any necessity for post-exposure incorporation of phosphor into the binder composition is completely obviated.

Further objects and advantages of the present invention will become apparent hereinafter as the description proceeds.

The attainment of the foregoing and related objects is made possible in accordance with the present invention which in its broaded aspects includes the provision of a process for the preparation of luminescent screens for color television tubes which comprises exposing to corpuscular radiation a light-insensitive composition comprising a light-insensitive organic binder layer containing inorganic phosphor particles uniformly dispersed therein, said exposure being sufficient to effect insolubilization of said binder material in the radiation-struck areas and thereafter treating said binder composition with aqueous media whereby to remove non-insolubilized portions, and wherein said organic binder material comprises a member selected from the group consisting of (1) polymers, (2) monomers, and (3) mixtures of (1) and (2) of water-soluble ethylenically unsaturated vinyl compounds containing at least one grouping of the formula



As specific examples of binder materials falling within the ambit of the foregoing definition there may be mentioned in particular and without necessary limitation polyvinyl pyrrolidone, polyethylene, polypropylene, polystyrene, polyvinyl acetate, polyvinyl methyl ether, poly(methoxyethyl) vinyl ether; copolymers including vinyl methyl ether/maleic anhydride, ethylene/-maleic anhydride, isobutyl vinyl ether/maleic anhydride, styrene/maleic anhydride, vinyl pyrrolidone/-maleic anhydride, poly(methoxyethyl) vinyl ether/-maleic anhydride, polyvinyl pyrrolidone/allyl amine; monomers including acrylamide, N,N'-methylenebisacrylamide, acrylic acid, methyl methacrylate, divinyl benzene, vinyl stearate, and the like.

It is critically important to the realization of the improvements described herein that the organic binder material be light-insensitive.

Within the context of the present invention, the term "light-insensitivity" is to be accorded the following significance. As is well known, the polymerization, cross-linking etc. of many ethylenically unsaturated organic materials may be effected by exposure to certain types of electromagnetic radiation and especially ultra-violet radiation. Since many of such organic materials exhibit appreciable sensitivity to such spectral radiation the use of catalysts or other promotors to augment the reaction is completely unnecessary. Thus, the insolubilization of organic polymeric resist materials is often carried out by the utilization of electromagnetic radiation emanating from the violet-blue region of the spectrum as the activating influence. In fact, the hardening reaction may occur merely upon standing of such materials for relatively short periods of time. Ethylenically unsaturated compounds of this type prove unsuitable for use in the preparation of luminescent screens for color television tubes in view of their sensitivity to the radiation emitted by the blue phosphor upon electron beam excitation, i.e., the blue-violet radiation emitted during the exposure interval is capable of initiating polymerization, cross-linking etc. If ethylenic compounds of this type are to be used it becomes necessary to omit the blue phosphor until exposure is completed.

In contradistinction to ethylenic materials of the aforedescribed type, the binder compounds contemplated by the present invention remain unaffected by the radiation emissions of each of the red, green and blue phosphor particles which occur during exposure. Thus, the blue phosphor may be present in the binder composition during the exposure step, thereby avoiding the multi-step procedure which would otherwise be necessary.

Particularly beneficial results are obtained in accordance with the present invention with the use of, for example, polymers of maleic anhydride, e.g., homopolymers, copolymers with an alkyl vinyl ether, etc.

Maleic anhydride polymers preferred for use comprise those containing from about 10 percent to about 65 percent on a mole basis of maleic anhydride units with the remainder comprising, for example, alkyl vinyl ether units, the alkyl moiety containing from one to about 20 carbon atoms, e.g., methyl, isobutyl, dodecyl, hexadecyl, octadecyl, etc.; ethylene; propylene; styrene; etc. Polymers of this general type are commercially available from the General Aniline and Film Corporation under the trademark designation "GANTREZ," "GANTREZ AN 149," which comprises a copolymer of maleic anhydride and methyl vinyl ether having a specific viscosity of 2.0 measured at 25°C as a one percent solution in methyl ethyl ketone.

Polymeric materials of this type can be readily deposited in the form of a uniform continuous layer according to conventional technique whereby to provide a coated layer having the required stability and resistance to viscosity changes upon standing. In general, it is found that the coating operation may be facilitated by the employment of the polymeric material in specific viscosities ranging from about .05 to about 5.0 as measured in one percent solutions in methyl ethyl ketone at 25°C. Optimum coating solution viscosities within the foregoing range can be readily determined in a particular circumstance by routine laboratory investigation.

The light-insensitive binder materials of the present invention may be utilized in the following manner. The electron beam-sensitive polymer, monomer or mixture thereof is first dissolved in aqueous media. The phosphor particles are thereupon dispersed in the aqueous medium. At this point, it is usually desirable to effect any necessary viscosity adjustment in the solution, such adjustments being consonant with expeditious deposition of the medium in the form of a continuous and uniform coating of the desired thickness. The thickness value selected is not a particularly critical factor in the practice of the present invention and thus may be selected from those values customarily employed in the art for such purposes. In general, thinner coatings are preferred in order to achieve the requisite degree of insolubilization. However, the coating thickness selected should be conducive to the provision of a structurally stable coating whereby to permit the selective removal of non-insolubilized areas following exposure without deleteriously affecting the exposed areas, e.g., undercutting. Thus, should the coating be excessively thin, inadvertent removal of exposed areas may result with consequent impairment of phosphor pattern reproduction. It will also be appreciated that the solution viscosity value selected will be influenced to a great extent by the coating method employed, i.e., flowing, whirling, etc. After allowing the layer thus deposited to dry, the shadow mask is positioned in the panel face. The picture tube face and that portion of the tube housing the electron guns are accurately positioned against each other employing a gasket of suitable material along the area of contact. The tube assembly is thereupon evacuated. The shadow mask is then swept by an electron beam emanating from the appropriate electron gun, i.e., that gun whose corpuscular emissions correspond to the particular color emitting phosphor pattern being laid down. Exposure is effected for a period of time sufficient to impart the requisite insolubilization to those areas subjected to the electron beam. Upon completion of the exposure, air is admitted to the system and the shadow mask retrieved. Thereupon, the shadow mask containing the latent image dot pattern in the form of insolubilized areas is treated with aqueous media whereby to effect removal of non-exposed areas, the latter corresponding to non-insolubilized portions. The foregoing sequence of operations is thereafter repeated for each of the remaining two primary colors whereby to form a complete tricolor phosphor dot pattern.

Thereafter, the usual steps of lacquering, aluminizing, shadow mask insertion, tube section sealing whereby to form an integral unit, baking and evacuat-

ing to burn away the binder, may thereafter be resorted to for purposes of providing the final product.

As the foregoing explanation makes clear, the process of the present invention makes possible the attainment of a most precise position relation between the electron gun, the shadow mask and the phosphor dot for each of the three colors. The phosphor dot reproduction obtained is of distinctly superior quality, i.e., extremely sharp, bright and totally free of metal contamination. This, of course, results in enhanced brilliance of emission upon electronic excitation of the phosphor. Moreover, and in contradistinction to processing involving the use of photosensitive binders, overexposure to the electron beam does not result in exaggerated growth in the dot dimension; this result obtains since the scattered light emissions emanating from the phosphor particles dispersed throughout the binder material are innocuous as regards imparting hardening effects to the binder material.

The term "water-soluble" as used in the context of the present invention is intended to encompass those ethylenically unsaturated materials which exhibit a sufficient degree of water-solubility, dispersibility or sensitivity to permit their expeditious coating in an aqueous system. Thus, it is recognized that particular circumstances dictate the feasibility of providing the ethylenically unsaturated compound in the form of an aqueous dispersion, suspension, emulsion, etc. in order to facilitate the attainment of an optimum coating. This can be readily achieved by the use of suitable suspending agents, emulsifying agents and dispersants well known in the art for such purposes. Regardless of the nature of the system employed for effecting deposition of the ethylenic material in the form of a uniform coating, it will be understood that it remains a critical imperative that such organic material be devoid of light-sensitivity as explained hereinbefore.

The present invention has been described with respect to certain preferred embodiments thereof and there will become obvious to persons skilled in the art variations, modifications and equivalents which are understood as coming within the scope of the present invention.

I claim:

1. In a process for the preparation of luminescent screens for color television tubes, the improvement which consists essentially of the sequential steps of exposing to corpuscular radiation a surface coated with a corpuscular radiation sensitive composition consisting essentially of a water soluble organic binder layer insolubilizable by corpuscular radiation containing inorganic phosphor particles uniformly dispersed therein, said organic binder material being unaffected by radiation emissions produced by said inorganic phosphor particles during said exposure, said exposure being sufficient to effect insolubilization of said binder material in the radiation-struck areas and thereafter treating said binder composition with water whereby to remove only unexposed non-insolubilized portions, and wherein said organic binder material comprises a member selected from the group consisting of polyvinyl pyrrolidone, polyethylene, polypropylene, polystyrene, polyvinyl methyl ether, poly (methoxy ethyl) vinyl ether, vinyl methyl ether/maleic anhydride copolymer, ethylene/maleic anhydride copolymer, isobutyl vinyl ether/maleic anhydride copolymer, styrene/maleic anhydride copolymer, vinyl pyrrolidone/maleic anhydride copolymer, poly (methoxy ethyl) vinyl ether/maleic anhydride copolymer, polyvinyl pyrrolidone/allyl amine copolymer, acrylamide, N, N'-methylenebisacrylamide, acrylic acid, methyl methylacrylate, divinyl benzene, vinyl stearate, and mixtures thereof.

2. A process according to claim **1** wherein said organic binder material comprises a copolymer of maleic anhydride and an alkyl vinyl ether wherein said alkyl moiety contains from one to about 20 carbon atoms and has a specific viscosity ranging from about .05 to about 5.0 measured at 25°C as a one percent solution in methyl ethyl ketone.

3. A process according to claim **2** wherein said alkyl vinyl ether comprises methyl vinyl ether.

4. A process according to claim **2** wherein said maleic anhydride/methyl vinyl ether copolymer contains from about 10 percent to about 65 percent on a mole basis of maleic anhydride and has a specific viscosity of 2.0 measured at 25° as a one percent solution in methyl ethyl ketones.

5. A process according to claim **1** wherein said water contains a surface active agent.

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