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COLOR-FILTER MATERIAL AND PREPARATION THEREOF

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In this specification I shall describe a preferred form of my invention, and specifically mention certain of its more important objects. I do not limit myself to what is herein disclosed, since various changes and adaptations may be made therein without departing from the essence of my invention as hereinafter claimed.

My invention relates to color-filter material for purposes of photography, and to methods of preparing the same. It will be found to be particularly useful in film packs for color-photography, wherein color filters are required.

For the purpose of color filters in film packs, it has been common practice to employ layers of gelatine containing a dye; but more or less serious difficulties have attended the use of such material. For instance, if any of the dye used in such layers is present in a free or unattached state, or if the dye is slightly soluble in the baths that are employed for processing the film, the effects are likely to be disastrous. Any contamination of such baths by the dye, may result in imparting color to the film in places where no color is wanted; and it is very difficult or impossible to completely remove such unwanted color, without leaving blotches, streaks, stains, or other defects.

Moreover, it usually is desirable or essential to be able to destroy the color in the filter layer at will, without leaving any indications of its former presence; and a preferred proceedure for this purpose has been to bleach out the color in an aqueous solution of hydrosulfite of sodium. If any of the dye of the filter layer, previous to the bleaching, has done any bleeding or wandering into other layers of the film, it may not be possible to wholly eradicate the effects of this bleeding in the bleaching process.

In view of what has been said, the objects of my invention include; first, to provide improved color-filter material for photographic purposes, wherein the color is absolutely fast, is incapable of bleeding or wandering, and is wholly insoluble in the baths that commonly are employed in photographic processes; second, to afford facilities for securing practically any desired shade or variety of color, in color-filter material having the aforesaid characteristics; and, third, to develop a practical and economical method for producing such color-filter material.

My objects have been attained in a manner that now will be described.

It is well known that certain metals may be transformed into salts that are colorless, fully transparent, and practically invisible when diffused thorughout a mass of gelatine, or other transparent colloidal substance. It is also well known that metallic salts are capable of acting as very strong mordants for a class of dyes that afford a wide range of colors. By utilizing this knowledge, I have found that it is easily possible to produce color-filter material for photographic purposes, that has certain advantages over what has hitherto been used. Thus, the color of my improved filter material results from dyestuffs becoming attached to exceedingly minute and uniformly diffused metallic particles within a colloidal substance, and not from coloring the colloidal substance itself. The colored metallic particles, and the dyes strongly mordanted thereto, are insoluble in any of the baths that are commonly employed in photographic processes and, consequently, no difficulty is encountered in the use of such material, as the result of wandering or bleeding of color. In such material, moreover, it is possible to secure practically any shade or intensity of any color desired, or of any combination of such colors.

I have found that silver iodide hydrosol is particularly satisfactory for use in mordanting dyes in such filter material; although other metallic salts, especially other silver halides, may be employed for the purpose.

For preparing the color-filter material, ordinary photographic emulsion containing a silver photo-sensitizer, may well be employed. Such an emulsion is first exposed to light; and it is then developed, fixed, and washed in the ordinary way, to clear it of all unreduced silver. The metallic silver will then be in the form of exceedingly minute grains; and, if the operation has been properly performed, these microscopic particles will be uniformly distributed throughout the colloidal substance in such quantity as to give the density desired.

The minute metallic silver grains are next bleached and transformed into a suitable transparent salt, such as silver iodide, in ways that are well understood in the art. For instance, the

emulsion may, as the next step in the process, be treated in a bath of

Potassium iodide	60 g.
Potassium iodate	1.5 g.
Pepsin	.5 g.
Water	1000 ccs.

Then, after washing, the material is immersed in a bath composed of

Potassium iodide	55 g.
Iodine	3 g.
Aluminum sulphate	10 g.
Acetic acid (glacial)	10 ccs.
Sodium acetate	7.5 g.
Water	1000 ccs.

The result of the foregoing treatment will render the silver content of the material as thoroughly transparent as glass, and it will be quite invisible. Any yellow stain that is due to the iodine may be quickly removed if desired, by metabisulphite of sodium.

After the emulsion has been treated in the aforesaid manner, it should be soaked in a bath containing, say, 5 g. of chrysodine R. in 1000 ccs. of water. The transparent silver iodide will act as a very strong mordant for this dye, and the material will be colored thereby in such a manner that the color cannot bleed or wander. Other desired dyes may be employed in a corresponding manner.

Color-filter material, prepared in the way described, may be coated upon photo-sensitized emulsions in any desired thickness, so as to serve as a color-filter therefor. The dye, although very strongly mordanted to the metallic salt, so that it cannot bleed or wander into adjacent material, may, nevertheless, be completely destroyed as to color, whenever desired, by bleaching in sodium hydrosulphite.

Another way of producing color-filter material embodying my invention, in which the reduced transparent silver salt primarily will be given a yellow color, is to treat the emulsion, after developing and clearing, in a bath composed of

Water	1000 ccs.
Potassium ferricyanide	2.74 g.
Ammonium chloride	4.01 g.
Nitric acid (36%)	2.15 ccs.
Vanadium oxalate solution	67 ccs.

The vanadium oxalate solution in the above formula is made by dissolving, in a warm water bath, 63 grams of ammonium Meta Vanadate in about 1000 ccs. of water in which 100 grams of oxalic acid have been dissolved.

Although silver that is bleached by the vanadium solution just described gives a result that is quite invisible as to structure, it is yellow in color. This color is not objectonable in certain photographic uses, and may even be desirable. It can be blended with other colors also, so as to produce satisfactory color filters. Silver treated by the vanadium process acts very strongly as a mordant, even when the tinge of yellow is very slight. Undesired products of the bleaching process are removed by hyposulphite of soda in water, leaving nothing but transparent products of vanadium.

Having thus fully described my invention in a manner that will be fully understood by those familiar with the art involved, I claim:

1. Color-filter material comprising; a transparent vehicle; a metallic salt in transparent form, dispersed throughout said vehicle; and a dye mordanted to said salt.

2. Color-filter material comprising; a transparent colloidal substance; a metallic salt in transparent form, uniformly dispersed throughout said substance; and a dye mordanted to said salt.

3. Color-filter material comprising; a body of transparent gelatine; a metallic salt in transparent form, uniformly dispersed throughout the gelatine; and a dye mordanted to said salt.

4. Color-filter material comprising; a transparent colloidal substance; a metallic halide in transparent form, uniformy dispersed throughout said substance; and a dye mordanted to said halide.

5. Color-filter material comprising; a transparent colloidal substance; a silver halide in transparent form, uniformly dispersed throughout said substance; and a dye mordanted to said halide.

6. Color-filter material comprising; a transparent colloidal substance; silver iodide in transparent form, uniformly dispersed throughout said substance; and a dye mordanted to said iodide.

7. The method of preparing color-filter material which comprises; uniformly dispersing a metallic hydrosol throughout a transparent colloidal substance; converting the hydrosol into its component metal; converting said metal into transparent metallic salt; and mordanting a dye to said salt.

8. The method of preparing color-filter material which comprises; uniformly dispersing a metallic hydrosol that is sensitive to radiation, throughout a transparent colloidal substance; converting the hydrosol into its component metal by the aid of radiation; converting said metal into transparent metallic salt; and mordanting a dye to said salt.

9. The method of preparing color-filter material which comprises; uniformly dispersing photo-sensitive metallic material throughout a transparent colloidal substance; reducing said material to its component metal, by the aid of radiation; converting said metal to metallic salt in transparent form; and mordanting a dye to said salt.

10. The method of preparing color-filter material which comprises; reducmg uniformly distributed photo-sensitive metallic material in an emulsion to its component metal, by the aid of radiation; converting said metal to metallic salt in transparent form; and mordanting a dye to said salt.

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