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METHOD OF PROVIDING A CARRIER WITH A LIGHT SENSITIVE SUBSTANCE AND ARTICLE PRODUCED THEREBY

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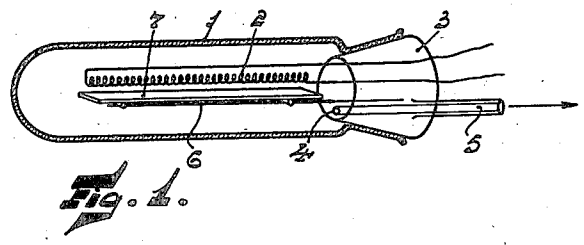


Fig. 1.

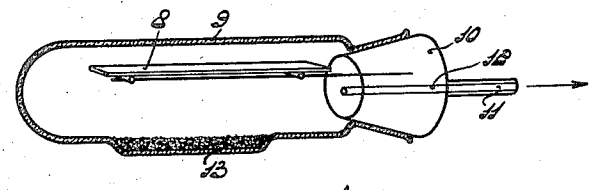


Fig. 2.

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METHOD OF PROVIDING A CARRIER WITH A LIGHT SENSITIVE SUBSTANCE AND ARTICLE PRODUCED THEREBY

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In Germany October 5, 1931

10 Claims. (Cl. 95—7)

Our invention relates to a process of providing a carrier with a substance which is sensitive to light and to the photographic material resulting from such process, and relates to improvements and modifications of the method described in our co-pending application Ser. No. 508,528 filed January 13, 1931, now Patent No. 1,970,496.

It has long been desired to increase the light sensitivity of photographic paper, plates and films, and various methods have been suggested in this connection.

As the binders generally used for light-sensitive substances absorb part of the ultra-violet light it has been found that elimination of such binders increases the sensitivity of photographic material for that light.

The best results, as far as the mentioned sensitivity is concerned, have been also thus far obtained with the so called "binder free" photographic materials and such are mostly used in special photography, as for instance for spectroscopic work, where great sensitivity for ultra-violet light is required.

One example of binder-free photographic material is known under the name of Schumann plate prepared by sedimentation of silver bromide from a photographic emulsion whereby only a very small percentage of gelatin binder is contained in the light-sensitive layer.

Another method of obtaining a binder-free photographic plate, film or paper is the one described in our above referred to prior application, in which the light-sensitive substance is caused to be deposited on a carrier from its vapor phase, for instance, by sublimation of silver bromide. Thereby the light-sensitive substance may be either deposited directly on the carrier or the carrier may be first provided with a substance which is capable of adsorbing the light-sensitive substance from the vapor phase. The adsorbing substance, for instance, calcium fluoride, is also preferably deposited on the carrier from its vapor phase. In this manner a light-sensitive carrier for photographic purposes may be obtained which is entirely free from a binder.

With the method described in the above application exceedingly good results are obtained and the materials obtained will lend themselves particularly well for copying purposes, for instance, for reproductions, this being apparently due to the particular composition and structure of the light-sensitive layers.

However, we have found that the photographic materials produced by our above processes, are unfavorably affected by repeated treatments in aqueous solutions, for instance by their treatment in the fixing baths, dye baths etc. In such cases, particles of the substance forming the image may be mechanically removed so that the definition and contrast is partly lost. When the light-sensitive substance is deposited on an adsorbent instead of being directly deposited on the carrier, the photographic material obtained according to the above invention, is more resistant to wet treatment. However, it is still affected if subjected to repeated wet treatment.

We have found that a binder can be provided in a photographic material which does not absorb light to an objectionable degree and therefore does not affect the sensitiveness of the light-sensitive substance.

According to our novel process, the carrier is provided with a thin layer consisting of an agglutinant on which the light-sensitive substance is caused to be deposited from its vapor phase. The resulting photographic materials are characterized by exceedingly high light sensitivity and at the same time are highly resistant to wet treatment.

It should be pointed out that in the photographic materials obtained by the present process, the light-sensitive substance is deposited on the agglutinant and is not incorporated therein and therefore does not absorb light, but acts in this regard as a binder-free photographic material.

By the deposition of the light-sensitive substance from its vapor phase, due to the particular structure of the photographic layer, a marked increase in the light sensitiveness of photographic materials is obtained. This advantage is fully maintained by depositing from its vapor phase the light-sensitive substance on the agglutinant according to our present improved process, instead of depositing such substance directly on the carrier or on an adsorbent layer as taught in the prior application. While thus the advantages of the prior process are fully maintained, its objection, namely, the comparatively small resistance to wet treatment, is eliminated.

One object of our invention is to provide a photographic material which has exceptionally great light sensitiveness.

A further object of our invention is to provide a photographic material and a process of making the same in which the light-sensitive substance is deposited from its vapor phase on an agglutinant provided on the carrier.

A further object of our invention is to provide a photographic material which comprises a binder, which does not absorb working light and

which material is highly resistant to treatment in aqueous baths and, at the same time, has exceedingly high light-sensitive properties.

As agglutinants, which are well suited to be used in our process, may be mentioned: gelatine, fish glue, agar-agar, water-glass, collodion, gum arabic, etc.

In practicing the present invention, we prefer to apply the method disclosed in our above referred to prior application, whereby the photographic material is produced by the vaporization of a metal salt and the subsequent deposition of the metal salt vapor. The resulting photographic material has none of the drawbacks mentioned in connection with the process of our prior application and may be subjected to the usual handling in aqueous solutions for its development, fixing, etc. by any wet method and by using the ordinary chemicals in such methods.

For instance, this material may be developed in a bath of 10% silver nitrate solution and subsequently treated with citric acid or acetic acid-metol solution.

Or, an alkaline pyrogallol solution with the addition of potassium bromide may be used for the developing bath.

In the drawing Fig. 1 is a perspective view of apparatus for carrying out the process of the invention and Fig. 2 is a similar view of a modified form of apparatus. Referring to Figure 1, a glass vessel 1 can be closed by a ground stopper 3 provided with a bore 4 which is continued in an extension 5. The ground stopper 3 carries a supporting plate 6 and an incandescible body 2, the latter being provided with the substance to be applied, for example by sublimation, to a glass plate 7 which is provided with a thin agglutinant layer, and bears on the supporting plate 6. Silver bromide is particularly suitable for this purpose. The silver bromide may be applied to the incandescible body by squirting thereon a suspension of silver bromide in alcohol or by immersing the incandescible body 2 in molten silver bromide. By means of the extension 5 the vessel is exhausted and then after the incandescible body 2 has been heated by an electric current during a short time, for example for some seconds, to about 700 to 800° C., a sufficient quantity of silver bromide has been applied by sublimation to the plate 7. The time of glowing required for obtaining a suitable layer depends on the temperature of the incandescent body, on the quantity of the substance to be volatilized, on the surface of the plate 7, etc. The layer preferably has a thickness from 0.1 to 100μ.

The other silver halides, and in general all volatilizable light-sensitive combinations, are also suitable for use in the process described above.

In Fig. 2 is shown a plate 8, provided with a thin agglutinant layer which is introduced into a vessel 9 on the bottom 13 of which is provided thallous iodide and which can be exhausted. The vessel 9, which may be of glass, is closed by a ground glass stopper 10 provided with a connecting piece 11 and a bore 12. After the vessel 9 has been exhausted the whole is brought to about 200–300° C. At this temperature, thallous-iodide vapour is produced of which a sufficient quantity is deposited on the agglutinant layer of the plate 8; a carrier provided with a light-sensitive layer being thus obtained.

The process can be so applied that the carrier is provided with a layer of an agglutinant and this agglutinant provided with an adsorbent such as calcium fluoride on which the light-sensitive substance is deposited. However in this new process the agglutinant layer makes the application of an adsorbent layer superfluous.

While we have described our novel process in connection with specific examples, it should be well understood that it is not limited thereto, but the appended claims should be construed as broadly as permitted, in view of the prior art.

What we claim is:

1. The process of manufacturing a carrier provided with a light-sensitive metal salt, comprising the steps of providing the carrier with a layer of an agglutinant and depositing the light-sensitve metal salt from its vapor phase on said agglutinant layer.

2. A photographic material, comprising a carrier, a thin layer of an agglutinant on said carrier and a light-sensitive metal salt deposited from its vapor phase on said agglutinant layer.

3. In the method of making photographic images, the steps which comprise, providing a carrier with an agglutinant, and depositing on said agglutinant a light-sensitive metal salt from its vapor phase to obtain a photographic material.

4. The process of making a light-sensitive layer comprising the step of depositing a light-sensitive metal salt from its vapor phase upon a layer of a suitable agglutinant.

5. The process of making a light-sensitive layer comprising the steps of providing a carrier with a layer of an agglutinant and depositing a light-sensitive metal salt from its vapor phase in vacuo on said agglutinant layer.

6. The process of making a light-sensitive layer comprising the steps of providing a carrier with a layer of an agglutinant and depositing a light-sensitive metal halide from its vapor phase on said agglutinant layer.

7. The process of making a light-sensitive layer comprising the steps of providing a carrier with a layer of an agglutinant and depositing a light-sensitive silver halide from its vapor phase on said agglutinant layer.

8. The process of making a light-sensitive layer comprising the steps of providing a carrier with a layer of an agglutinant and depositing silver bromide from its vapor phase on said agglutinant layer.

9. The process of making a light-sensitive layer comprising the steps of providing a carrier with a layer of an agglutinant and depositing a light-sensitive metal salt from its vapor phase on said agglutinant layer.

10. A photographic material comprising a carrier, a thin layer of an agglutinant on said carrier and a light-sensitive metal salt deposited from its vapor phase on said agglutinant layer.

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