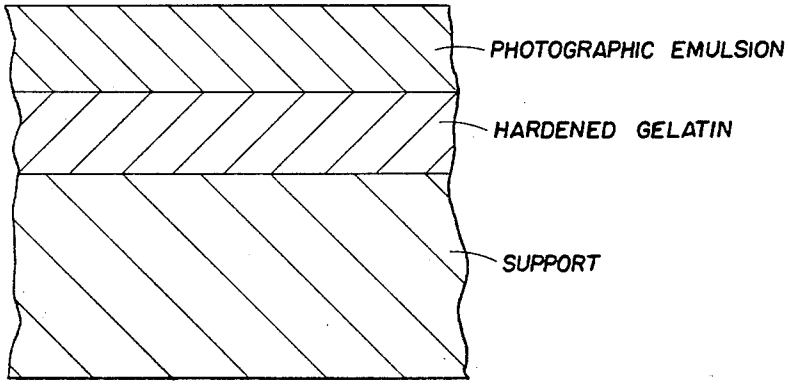
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PHOTOGRAPHIC ELEMENTS CONTAINING
A HARDENED GELATIN LAYER
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PHOTOGRAPHIC ELEMENTS CONTAINING A HARDENED GELATIN LAYER

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ABSTRACT OF THE DISCLOSURE

In conventional processes for manufacturing photographic elements comprising a support overcoated by a layer of gelatin which in turn is overcoated with a layer of photosensitive emulsion, the gelatin ordinarily "hardens" after the photosensitive emulsion layer has been coated thereon. If the gelatin layer is allowed to harden before the photosensitive emulsion is applied to its surface, the adhesion of the photosensitive emulsion layer is very poor. It was found that treatment of the surface of hardened gelatin coatings by electron bombardment to reduce their contact angle measured with water to below 75° substantially improves the adhesion properties of the gelatin layer with subsequently-coated photosensitive emulsion layers.

This invention relates to photographic elements, and more particularly to supports having a hardened gelatin coating thereon and an adherent photographic emulsion coating thereover, and to the process of preparing such photographic elements.

One object of our invention is to provide photographic elements comprising a support having a hardened gelatin coating thereon and an adherent photographic emulsion coating thereover. Another object of our invention is to provide a process for the preparation of photographic elements featuring a gelatin coated support having an adherent photographic emulsion coating thereon. Other objects of our invention will appear herein.

These and other objects of our invention are accomplished by subjecting a support having a hardened gelatin coating thereon to a corona discharge, and coating a light sensitive photographic emulsion thereover. We have found that corona discharge treatment of hardened gelatin coated photographic supports increases the adhesion of photographic emulsions to such supports, but does not impair the photographic properties of the emulsion.

In accordance with a preferred embodiment of our invention, a photographic support comprising paper stock suitable for photographic purposes is surface sized with gelatin containing a hardener, such as formaldehyde or chromic chloride, and the hardened gelatin coating is then electron bombarded. The bombarded gelatin coating may contain, if desired, pigments, dyes or the like. Subsequently, a gelatin silver halide emulsion is coated over the electron bombarded gelatin and sized paper support.

The accompanying drawing shows a photographic element in accordance with our invention comprising a support having an electron bombarded hardened gelatin coating thereon and a photographic emulsion layer thereover.

Our invention will be further illustrated in the following example.

EXAMPLE 1

A baryta coated photographic paper stock (weighing 11 lbs. per 1000 sq. ft.) was given a hardened gelatin coating which was electron bombarded using apparatus of the type disclosed in Rothacker U.S. Patent 2,864,755 to provide a contact angle (described hereinafter) of approximately 65°. A photographic gelatino silver halide emulsion was then coated onto the photographic support. A similar element was prepared as a control in which the support was not electron bombarded. The two elements obtained were tested for adhesion. It was found that the emulsion adhesion was greatly improved when the gelatin coated paper stock had been electron bombarded prior to emulsion coating. This superior adhesion is particularly evident when the paper coated with the emulsion is placed in an aqueous solution, such as a developer solution, and then tested by attempting to pull the emulsion coating from the support. The electron bombardment of the support did not affect the photographic properties of emulsions coated thereon.

The supports which are useful in accordance with our invention include all the usual photographic supports, with paper supports being particularly advantageous. Any photographic supports may be employed in accordance with the invention which has a hardened gelatin coating thereon.

In accordance with our invention, a photographic support is provided with a hardened gelatin coating. Any gelatin hardener, such as formaldehyde or chromic chloride, or the hardeners described in U.S. Patent 3,039,873, Col. 12, lines 5–33, and the literature referred to therein, may be employed.

Preferably, the photographic elements of our invention comprise electron bombarded, hardened gelatin coated paper supports coated thereover with a gelatino silver halide emulsion. Other hydrophilic colloid photographic binders may, however, be employed with good results. For example, light sensitive silver halide salts may be incorporated in any of the binders described in Col. 13, lines 36–67 of U.S. 3,039,873 and coated on electron bombarded hardened gelatin coated supports. Any supports may be used, such as supports composed of paper, film base such as cellulose acetate, polyethylene terephthalate, polycarbonate and the like, metal (e.g., aluminum) and glass. In order to obtain satisfactory adhesion between the support and the hardened gelatin coating, it is sometimes desirable to provide a primer or subbing coating, or to electron bombard the support.

The hardened gelatin coating has a contact angle prior to electron bombardment greater than 75°. The minimum electron treatment needed for suitable emulsion adhesion provides a contact angle of less than 75°. As employed herein and in the appended claims, the term "contact angle" refers to a test for evaluating changes in the surface of the gelatin coated substrate produced by the corona discharge. The test to determine the contact angle is conducted by placing a drop of distilled water on a level sample, projecting the image of the drop and sample on a suitable screen and measuring the angle obtained by drawing a line tangent to the drop image at the point the edge of the drop touches the sample. The angle obtained is the contact angle and may be measured quickly and accurately by using a contour projector as the means of projection.

Any apparatus previously disclosed in the art, such as the Rothacker patent referred to in Example 1, may be suitably employed to electron bombard the hardened gelatin coated support. A corona discharge necessary to obtain satisfactory adhesion may be obtained by varying the electrical conditions with respect to frequency, voltage, number of electrodes and the like in the desired manner to obtain a suitable contact angle.

The invention has been described in detail with particular reference to preferred embodiments thereof but it will be understood that variations and modifications

can be effected within the spirit and scope of the invention as described hereinabove and as defined in the appended claims.

We claim:

1. A treated element suitable for use as a base for a photographic element by subsequently coating said treated element with at least one layer of photographic emulsion, said treated element comprising a support having coated thereon a chemically hardened gelatin coating, said hardened gelatin coating having initially had a contact angle measured with water of greater than 75° and having been subjected to electronic bombardment to obtain a contact angle of less than 75° measured with water.

2. A photographic element comprising a support having a chemically hardened gelatin coating thereon and a photographic emulsion coating thereover, said hardened gelatin coating having initially had a contact angle measured with water of greater than 75° and having subsequently been electron bombarded to obtain a contact angle of less than 75° measured with water.

3. Claim 2 wherein the photographic emulsion is a gelatino silver halide emulsion.

4. The process of improving the adhesion of a photographic emulsion to a chemically hardened gelatin coated photographic support which comprises electron bombarding the gelatin coating to obtain a contact angle of less than 75° measured with water prior to applying the photographic emulsion thereon; the contact angle of said hardened gelatin coating prior to said electron bombarding having been greater than 75° measured with water.

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