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PHOTOGRAPHIC PAPER BASE

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This invention relates to a photographic paper base in which formaldehyde-forming compounds were used in its preparation which is surface sized with melamine, dimedon, or urea to prevent migration of formaldehyde from the paper base to layers which are applied thereto.

Paper useful in the preparation of photographic products has been treated with synthetic resins having formaldehyde groupings therein to impart good wet strength to the paper. Urea-formaldehyde and melamine-formaldehyde resins have been especially suggested for this purpose. Often gelatin sized papers have been treated with formaldehyde to render the gelatin size more resistant to the effect of water. In papers prepared using those resins there has been evidence of adverse effects because of formaldehyde migrating from the paper to layers present thereon. For instance, in some cases in color photography the dyes employed may become contaminated by formaldehyde causing staining of the photographic product. In other cases photographic emulsions have been desensitized by formaldehyde. In still other cases the photographic layers employed have been hardened excessively due to the continued presence of formaldehyde. In some cases formaldehyde may affect the image tones of prints causing coldness in the image thereon. Because of the derogatory action of considerable amounts of formaldehyde, the amount of wet-strength resin used in paper has been often held to the lowest limit which would give satisfactory results.

As one remedy for this situation, it has been proposed to size photographic paper base with some wet-strength imparting material which does not give rise to an aldehyde. In other cases, the proportion of wet strength imparting resin used has been kept to a minimum to avoid objectionable migration of excess formaldehyde to other parts of the photographic product. We have found that formaldehyde migration in photographic papers where wet-strength imparting resin has been used in the paper base can be prevented if a surface sizing having an appreciable amount of melamine, urea or 5,5-dimethyl-1,3-cyclohexanedione has been applied to the paper. We have found that by the use of a sizing containing appreciable amounts of one of these compounds (such as up to 3% of dimedon or melamine or up to 10% urea), the formaldehyde migration is prevented even where it might otherwise be troublesome.

One object of our invention is to provide a paper useful as a base for photographic products. Another object of our invention is to provide paper containing formaldehyde-forming compounds with a layer of urea, melamine or dimedon thereon to inhibit detrimental migration of formaldehyde material. A further object of our invention is to provide a means of preventing formaldehyde migration in paper so that the amount of melamine resin which is employed in the paper is not restricted but yet no adverse photographic effect results. Other objects of our invention will appear herein.

Paper in accordance with our invention is prepared

from paper stock which had been treated with a formaldehyde-type resin or with a formaldehyde hardener in the course of its preparation. This paper is surface sized with an aqueous composition of a colloidal material such as gelatin, glue, starch, rosin, or a stearic acid derivative containing therein a substantial proportion of material designated herein as useful for the prevention of formaldehyde migration. It is desirable to use a large excess of the antimigration material in the sizing composition so as to be sure to produce an effective layer. As the materials listed are inert and well soluble in water, the presence of an excess thereof is not desirable. Although any amount of the melamine, dimedon or urea is helpful, it is preferred that the excess be large such as on the order of 20 times that which would combine with the formaldehyde which would migrate. No one of the compounds listed are photographically active so that there is no adverse effect upon a photographic emulsion which is applied as a photosenitive layer over the paper base thus prepared.

Our invention includes not only paper which has been surface sized with a sizing material containing melamine, dimedon, or urea, but in addition includes photographic products in which a paper having a layer of that nature has thereon a photosensitive emulsion layer. Whether intended for color or black and white type products the surface sizing may be applied to the paper either while the paper is in wet form as it comes from the paper making machine or it may be applied to paper which has been dried. Our invention is particularly applicable to the sizing of high wet strength paper to be employed as a photographic base such as one which has been prepared by incorporating in the paper stock from which it has been prepared a melamine-formaldehyde or urea-formaldehyde high wet strength resin. Upon applying to the paper so prepared a sizing containing melamine, dimedon or urea, formaldehyde from the paper stock is reduced to an appreciable extent and formaldehyde effects are minimized or even eliminated therefrom. We have found that this reduction in formaldehyde migration from the paper base has improved the stability of several types of photographic emulsions when placed thereon, thus reducing dye contamination of certain types of photographic emulsions and improving the image tone of black and white professional type papers. Controlling formaldehyde migration makes possible the use of greater amounts of wet strength resins in paper resulting in increased wet strength and intensifying of other physical properties.

The following examples illustrate our invention:

Example 1

8.2 pounds of 5,5-dimethyl-1,3-cyclohexanedione (dimedon) was dissolved in 50 gal. of water at 180° F. There was then added thereto gelatin at the rate of 37 pounds per 100 gal. of solution, the gelatin having first been soaked for ½ hour in 30 gal. of cold water. The mass was stirred until the gelatin dissolved, the temperature was adjusted to 120° F. and the volume was brought to 100 gal. High wet strength paper in which was incorporated melamine formaldehyde resin was surface sized with this solution and the paper was dried in the usual manner. The paper was then coated with a photosensitive emulsion. It was found that there was no evidence of any appreciable formaldehyde migration in the photographic paper thus prepared.

Example 2

The above example was repeated except that 18 pounds instead of 37 pounds of gelatin was employed in preparing the sizing solution. Paper was surface-sized therewith as described in Example 1. The paper thus prepared was found to be resistant to the effects of formaldehyde migra-

tion as might otherwise arise from the melamine-formaldehyde resin present in the paper.

Example 3

Example 1 was repeated except that 8.2 pounds of melamine was employed in place of the 5,5-dimethyl-1,3-cyclohexanedione specified in Example 1. In the paper which results, formaldehyde migration is minimized as shown by the good stability of the product and the lack of any detrimental effect upon the emulsion layer which is applied thereon. If desired, materials which have an advantageous effect may also be incorporated therein such as a preservative material like Dowicide G. If the presence of pigment is desired, that may also be incorporated in the surface sizing composition which is employed.

Example 4

Example 1 was repeated except that 8.2 pounds of urea was employed in place of the 5,5-dimethyl-1,3-cyclohexanedione specified. The paper which resulted was dried and a gelatin-silver halide photographic emulsion layer was applied thereto. There was no evidence of any substantial formaldehyde migration in the photographic paper thus prepared.

We claim:

1. Photographic paper base comprising paper containing a wet-strength imparting amine-formaldehyde resin therein which paper has thereon a sizing layer containing a substantial proportion of a compound selected from the group consisting of urea, melamine and 5,5-dimethyl-1,3-cyclohexane dione.

2. Photographic paper base comprising paper having an amine-formaldehyde resin therein having thereon a size coating containing therein a substantial proportion of melamine.

3. Photographic paper base comprising paper having an amine-formaldehyde resin therein having thereon a size coating containing therein a substantial proportion of 5,5-dimethyl-1,3-cyclohexane dione.

4. Photographic paper base comprising paper having an amine-formaldehyde resin therein having thereon a size coating containing therein a substantial proportion of urea.

5. Photographic paper base comprising paper having wet-strength imparting melamine-formaldehyde resin therein which paper has thereon a sizing layer containing a substantial proportion of a compound selected from the group consisting of urea, melamine and 5,5-dimethyl-1,3-cyclohexane dione.

6. Photographic paper base comprising paper having wet-strength imparting urea-formaldehyde resin therein which paper has thereon a sizing layer containing a substantial proportion of a compound selected from the group consisting of urea, melamine and 5,5-dimethyl-1,3-cyclohexane dione.

7. Photographic paper comprising a paper base containing a wet-strength imparting amine-formaldehyde resin therein and a sizing layer containing a substantial proportion of a compound selected from the group consisting of urea, melamine and 5,5-dimethyl-1,3-cyclohexane dione and residing over the sizing layer a photosensitive layer.

8. Photographic paper comprising a paper base containing a wet-strength imparting amine-formaldehyde resin therein and a sizing layer containing a substantial proportion of a compound selected from the group consisting of urea, melamine and 5,5-dimethyl-1,3-cyclohexane dione and residing over the sizing layer a silver halide photosensitive layer.

9. Photographic paper comprising a paper base containing a wet-strength imparting melamine-formaldehyde resin therein, a sizing layer thereon containing a substantial proportion of a compound selected from the group consisting of urea, melamine and 5,5-dimethyl-1,3-cyclohexane dione and residing over the sizing layer a silver halide photosensitive layer.

10. Photographic paper base comprising paper sized with formaldehyde-hardened gelatin containing said formaldehyde containing a sizing layer thereon containing a substantial proportion of a compound selected from the group consisting of urea, melamine and 5,5-dimethyl-1,3-cyclohexane dione.

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