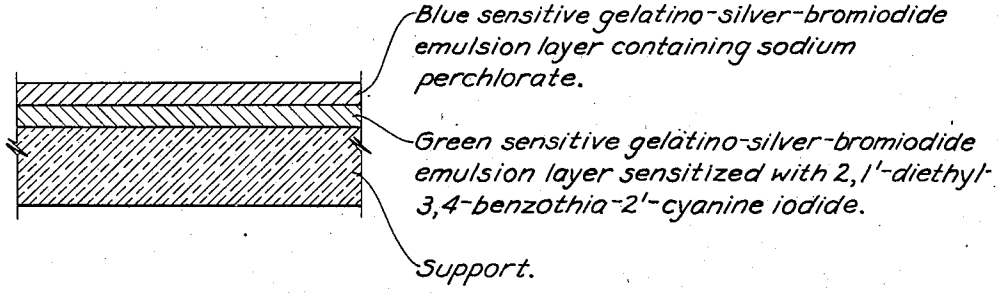
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PREVENTION OF DIFFUSION OF SENSITIZING DYES

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PREVENTION OF DIFFUSION OF SENSITIZING DYES

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This invention relates to the prevention of diffusion of sensitizing dyes in photographic silver halide emulsions.

Whenever two or more silver halide emulsion layers of different spectral (color) sensitivity are superposed on one side of a support (whether the layers are separated by an inert colloidal layer or not), as in monopack color processes, one of the principal difficulties encountered is the diffusion of sensitizing dyes from one layer to another. Diffusion becomes very noticeable when an ordinary blue-sensitive silver halide emulsion layer is superposed on a silver halide emulsion layer which is sensitized to green light by means of sensitizing dyes, the sensitizing dyes in the green sensitive layer diffusing into the blue-sensitive layer.

I have now found that diffusion of quaternary ammonium salt type sensitizers (e. g. cyanine salts, hemicyanine salts and styryl salts) from emulsion layers can be prevented by incorporating in the emulsion layer containing the sensitizer or in an emulsion layer superposed thereon, a perhalogenate salt other than a quaternary ammonium perhalogenate.

It is, accordingly, an object of my invention to provide a method for preventing diffusion of sensitizing dyes in photographic emulsions. A further object is to provide new photographic elements. Other objects will appear hereinafter.

As perhalogenate salts, I have found that the alkali metal perhalogenates are inert toward the emulsion and are advantageously employed. The perhalogenate salt is advantageously incorporated in the emulsion after the sensitizing dyes, inasmuch as the sensitizing dyes are likely to be coagulated (and therefore to sensitize unsatisfactorily), if the perhalogenate salt is added to the emulsion before the sensitizing dyes. The perhalogenate salt is advantageously employed in a concentration several times that of the sensitizing dyes. Thus, whereas the sensitizing dyes are employed in concentrations of 10 to 20 mg. per liter of emulsion containing 0.25 gram-mole of silver halide, the perhalogenate salts are advantageously employed in concentrations very considerably larger than these values, viz. 0.5 to 5 grams per liter of emulsion containing 0.25 gram-mole of silver halide, i. e. 2 to 20 grams per gram-mole of silver halide.

My invention is particularly useful for preventing diffusion of sensitizing dyes from a green-sensitive emulsion layer to an ordinary blue-sensitive emulsion layer superposed thereon and can be conveniently illustrated with reference to such a case. Thus, if, in a photographic element, such as employed in monopack color processes, a green sensitive gelatino-silver-bromiodide emulsion layer which is sensitized with 2,1'-diethyl-3,4-benzothia-2'-cyanine iodide (in a concentration of about 40 mg. of dye per gram-mole of silver halide) is overcoated with an ordinary blue-sensitive gelatino-silver-bromiodide emulsion, the upper coat will show appreciable green sensitivity owing to diffusion of the cyanine iodide from the green-sensitive layer to the blue-sensitive layer. If, however, sodium perchlorate or sodium periodate is added to either the green-sensitive or the blue-sensitive emulsion layers, preferably the latter, in a concentration of 10 grams per gram-mole of silver halide, prior to coating, the diffusion of the sensitizing dyes is reduced to a negligible value. The sodium perchlorate (or periodate) is advantageously incorporated in the emulsion in the form of a concentrated aqueous solution.

My invention is, of course, directed primarily to photographic elements made up employing the customary gelatino-silver-halide developing-out emulsions. However, silver bromide emulsions where the carrier is a substance other than gelatin, e. g. a cellulose derivative or resinous material can also be employed.

The accompanying drawing shows, diagrammatically, a photographic element, prepared in accordance with one embodiment of my invention, comprising a support coated with a green-sensitive gelatino-silver-bromiodide emulsion layer sensitized with 2,1'-diethyl-3,4-benzothia-2'-cyanine iodide, the green-sensitive emulsion layer being coated with a blue-sensitive gelatino-silver-bromiodide emulsion layer containing sodium perchlorate.

What I claim as my invention and desire to be secured by Letters Patent of the United States is:

1. A photographic silver halide emulsion sensitized with a quaternary ammonium salt sensitizer and containing a perhalogenate salt other than a quaternary ammonium perhalogenate.

2. A photographic gelatino-silver-halide emulsion sensitized with a quaternary ammonium salt sensitizer and containing a perhalogenate salt other than a quaternary ammonium perhalogenate.

3. A photographic gelatino-silver-halide emulsion sensitized with a quaternary ammonium

salt sensitizer and containing an alkali metal perhalogenate.

4. A photographic gelatino-silver-halide emulsion sensitized with a quaternary ammonium salt sensitizer and containing an alkali metal perchlorate.

5. A photographic gelatino-silver-halide sensitized with a cyanine salt sensitizer and containing an alkali metal perchlorate.

6. A photographic element comprising two gelatino-silver-halide emulsion layers superposed on one side of a support, the one layer being sensitized to green light with a sensitizing dye of the quaternary ammonium salt type, and the other layer containing a perhalogenate salt other than a quaternary ammonium perhalogenate.

7. A photographic element comprising two gelatino-silver-halide emulsion layers superposed on one side of a support, the one layer being sensitized to green light with a sensitizing dye of the quaternary ammonium salt type, and the other layer containing an alkali metal perhalogenate.

8. A photographic element comprising two gelatino-silver-halide emulsion layers superposed on one side of a support, the one layer being sensitized to green light with a sensitizing dye of the quaternary ammonium salt type, and the other layer containing an alkali metal perhalogenate in a concentration of from about 2 to about 20 grams per gram-mole of silver halide in the layer.

9. A photographic element comprising two gelatino-silver-halide emulsion layers superposed on one side of a support, the one layer being sensitized to green light with a sensitizing dye of the quaternary ammonium salt type, and the other layer containing an alkali metal perchlorate.

10. A photographic element comprising two gelatino-silver-halide emulsion layers superposed on one side of a support, the one layer being sensitized to green light with a sensitizing dye of the quaternary ammonium salt type, and the other layer containing an alkali metal perchlorate in a concentration of from about 2 to about 20 grams per gram-mole of silver halide in the layer.

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