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PHENAZINE AND NAPHTHAZINE FOG INHIBITOR FOR PHOTOGRAPHIC EMULSIONS

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This invention relates to fog inhibitors for photographic emulsions and to photographic emulsions containing them.

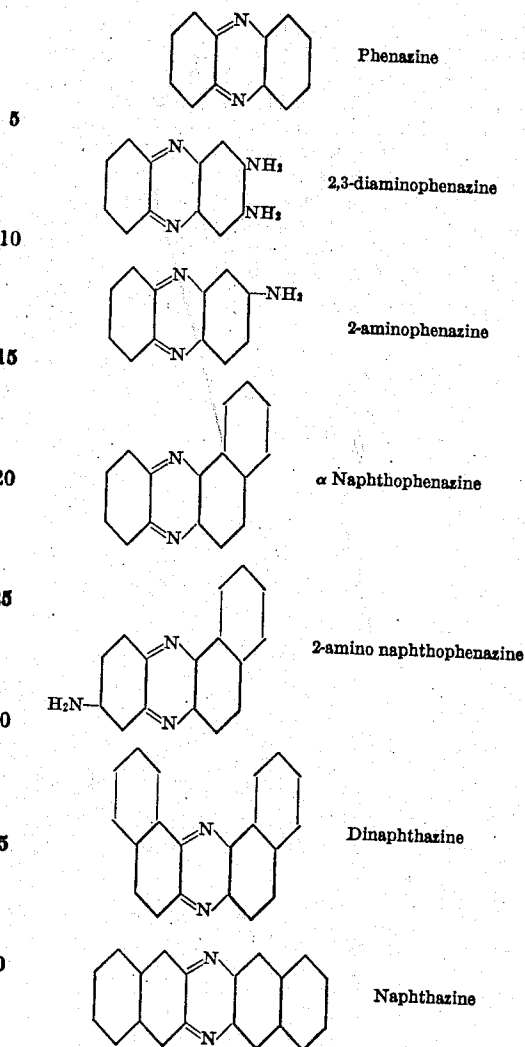
It is known that photographic emulsions particularly ultra-sensitive emulsions, or those containing color sensitizers exhibit a tendency to form a deposit of silver in the emulsion. This deposit extends more or less uniformly over the entire emulsion and is known as fog. Photographic fog is of two types, local and general. Local fog is formed by exposure of the film or plate at undesired points, as by a light leak in the camera. General fog or, as it is sometimes known, chemical fog, is formed in a number of ways. It may be caused by the conditions under which the film or plate is stored, such as conditions of high temperature or unusually long time of storage. The nature of the emulsion, as where emulsions are highly sensitive may also produce chemical fog, as well as the conditions of development of the emulsion, as by development for protracted periods of time or at temperatures above normal. Highly sensitive emulsions are more likely to fog than those of lower sensitivity, owing to the small amount of energy required to make a silver halide grain developable. We are concerned primarily with general or chemical fog.

The principal object of the present invention is to provide fog inhibiting agents for photographic emulsions which decrease the tendency of the emulsions to form general or chemical fog and, therefore, increase its stability. A further object is to provide fog inhibiting agents which do not markedly lower the sensitivity of the emulsion.

These objects are accomplished by incorporating in the emulsion suitable amounts of phenazine or naphthazine or an amino-substituted derivative of phenazine or naphthazine.

We have found that phenazine and naphthazine and amino-substituted derivatives of these compounds exhibit good fog inhibiting properties when incorporated in photographic emulsions and that they do not desensitize the emulsion to any appreciable extent. We have also found that while these compounds are good for inhibitors for photographic emulsions, not all derivatives of phenazine and naphthazine are satisfactory for this purpose. For example, hydroxy derivatives of phenazine failed to show positive fog inhibiting action in emulsions.

Compounds suitable for use as fog inhibitors in photographic emulsions according to our invention are the following:



These compounds may be used in various amounts in the emulsion depending upon the nature of the emulsion and other factors. In general, they may be used in concentrations ranging from 0.00005 gram to 0.5 gram per 1000 cc. of gelatino silver halide emulsion containing about 7% gelatin. Phenazine was found to show stabilization of emulsions between concentrations of 0.004 and 0.45 gram per 1000 cc. of emulsion and 2,3-diaminophenazine was found to show stabilization between concentrations of 0.00005 and 0.005 gram per 1000 cc. of emulsion.

It is to be understood that more or less of the anti-foggant than the amounts stated above may be used. In general, however, if a greater amount is used in the emulsion either no increased fog inhibiting effect is obtained or there is a loss in sensitivity of the emulsion. The fog inhibiting agents are incorporated by mixing them with any suitable solvent which is inert to the sensitive emulsion such as ethyl alcohol or other liquid in which the anti-fogging compound is soluble. An ethyl alcohol solution of 1% strength of phenazine was found to be suitable for incorporation of the compounds used according to the present invention.

The following example, which is illustrative only, indicates a method of incorporating the fog inhibiting agents in photographic emulsions according to our invention.

Example

A gelatino silver halide negative emulsion which had been made in the usual way was heated on a water bath to a temperature sufficient to melt it. This emulsion contained about 7% gelatin. To a 1000 cc. portion of this emulsion there was added a solution of 4.5 cc. of ethyl alcohol containing about 0.045 gram of phenazine. The resulting solution was thoroughly mixed and was coated on glass plates dried and incubated for about a week at 60° C. to obtain a fog test. There was found to be a marked fog inhibiting action through use of the phenazine as

compared with a similar emulsion to which no fog inhibiting agent had been added.

The fog inhibiting agents which we have described may be used in various kinds of photographic emulsions. In addition to being useful in ordinary non-color sensitized emulsions they may also be used in orthochromatic, panchromatic and X-ray emulsions. They may be used with or without color sensitizing dyes and if used with the sensitizing dyes they may be added to the emulsion before or after the dyes are added. Various silver salts may be used as the sensitive salt, such as silver bromide, silver iodide, silver chloride or mixtures of these. The dispersing agent may be gelatin or other colloids, such as collodion, albumin, or suitable cellulose organic derivatives or artificial resins.

It is to be understood that we contemplate as included within our invention all modifications and equivalents coming within the scope of the appended claims.

What we claim and desire to secure by Letters Patent of the United States is:

1. A photographic silver halide emulsion containing phenazine as an anti-foggant.

2. A gelatino silver halide emulsion containing as an anti-foggant from about 0.004 gram to about 0.45 gram per 1000 cc. of emulsion of phenazine.

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