

UNITED STATES PATENT OFFICE

2,384,593

ANTIFOGGANT

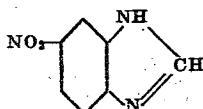
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No Drawing. Application August 6, 1943,
Serial No. 497,687

4 Claims. (Cl. 95—88)

This invention relates to photography and particularly to a photographic fog inhibiting agent.

Various compounds have been proposed for use in photographic emulsions and developers to inhibit the formation of fog upon development of the emulsion. Trivelli and Jensen, in Journal of the Franklin Institute, Vol. 210, 1930, page 287, proposed the use of 6-nitrobenzimidazole



in the developer for this purpose. Trivelli and Jensen found that 6-nitrobenzimidazole was superior to potassium bromide and potassium iodide in hydroquinone, pyrogallol and p-aminophenol developers for inhibiting fog while giving the least depression of image densities.

The use of 6-nitrobenzimidazole nitrate has also been recommended as an anti-foggant for photographic developers. This compound is a more powerful anti-foggant than the free base but it has the disadvantage that, although used in very small proportions in relation to the other ingredients of the developer, it is very sparingly soluble in alkaline solutions. This gives rise to difficulties, particularly when incorporated in the dry powder form of photographic developers to be dissolved in water for use. Due to the low solubility of the 6-nitrobenzimidazole nitrate and the extremely small amount employed, it is very difficult to judge when complete solubility has taken place. Because of the extremely powerful action of this anti-foggant, this incomplete solubility frequently leads to erratic behavior and non-uniform results of the developing solution. If the anti-foggant is not completely dissolved, the fog inhibiting effect is lower than would be expected, and particles of the compound may effect the emulsion locally where they come in contact with it.

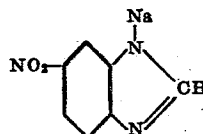
A further disadvantage in the use of 6-nitrobenzimidazole nitrate is that the nitrate group gradually reacts with the reducing agents present in the developer causing discoloration and loss of efficiency. Dry powder photographic developers are usually packaged in two compartments, one containing the reducing or developing

agent and the other containing the sulfite, carbonate or other ingredients of the developer. If the 6-nitrobenzimidazole nitrate is incorporated with the reducing agent, it is unstable and, after a short time, leads to discoloration and oxidation of the reducing agent. If incorporated with the alkali powder, reaction occurs with the formation of the free base and solubility is greatly lowered.

It is, therefore, an object of the present invention to provide an improved fog inhibiting agent for photographic use. A further object is to provide a photographic developing solution which has effective fog inhibiting action and greater stability than those heretofore used. A still further object is to provide a stable dry powder photographic developer having fog inhibitor therein. Other objects will appear from the following description of my invention.

These objects are accomplished by employing as the fog inhibiting agent an alkali-metal salt of 6-nitrobenzimidazole such as the sodium salt.

The alkali-metal salts of 6-nitrobenzimidazole such as the sodium or potassium salts are extremely soluble in water or in alkaline solution and may, therefore, be rapidly dissolved along with the other ingredients of a photographic developing solution. These salts are believed to be formed by substitution of the alkali-metal radical on the NH group of the 6-nitrobenzimidazole as shown in the following formula for the sodium salt of 6-nitrobenzimidazole although I do not wish to be restricted to compounds of this structure if the salt is formed in some other manner:



The sodium salt derivative of 6-nitrobenzimidazole has no detrimental reaction with sodium carbonate or sodium sulfite either in dry powder form or in aqueous solution. I have found that in the preparation of dry powder developers the sodium derivative of 6-nitrobenzimidazole may most advantageously be incorporated with the alkaline powder without deterioration or change occurring during storage. Upon dissolving the mixture in water, complete solubility of the so-

dium salt is obtained and a developer of uniform action is produced.

The following example illustrates a dry powder developer compounded according to my invention:

	Grams
A. Monomethyl-p-aminophenol sulfate----	1
Hydroquinone-----	3
B. Sodium sulfite-----	30
Sodium metaborate-----	10
Potassium bromide -----	1
Sodium salt of 6-nitrobenzimidazole--	0.125

For use, A is dissolved in about 700 cc. of water at 125° F., then B is added and finally water is added to make one liter.

The sodium salt of 6-nitrobenzimidazole may be prepared as follows:

(1) An excess of 40% sodium hydroxide was added to about 100 cc. of a solution made up of 32.3 grams of 6-nitrobenzimidazole and 8 grams of sodium hydroxide. The brilliantly yellow colored sodium salt precipitated in almost quantitative yield. The salt was filtered off and dried at 50° C., or above.

(2) The sodium salt of 6-nitrobenzimidazole may also be prepared by dissolving 8 grams of sodium hydroxide in 100 to 150 cc. of water and adding 32.3 grams of 6-nitrobenzimidazole to the solution. The solution is then warmed until the ingredients are completely dissolved and the solution then evaporated to dryness preferably in

vacuum. This gives a quantitative yield of the sodium salt.

For preparation of the potassium salt of 6-nitrobenzimidazole, an equivalent amount of potassium hydroxide is used instead of sodium hydroxide.

Although I have referred particularly to the incorporation of the alkali-metal salts of 6-nitrobenzimidazole in the developing solution, it will be understood that these compounds may also be incorporated in the silver halide emulsion itself.

I claim:

1. A photographic developer containing a silver halide developing agent and a fog inhibiting amount of an alkali-metal salt of 6-nitrobenzimidazole.

2. A photographic developer containing a silver halide developing agent and a fog inhibiting amount of the sodium salt of 6-nitrobenzimidazole.

3. A dry powder composition for dissolving in water to produce a photographic developing solution comprising a silver halide developing agent, an alkali and a fog-inhibiting amount of an alkali-metal salt of 6-nitrobenzimidazole.

4. A dry powder composition for dissolving in water to produce a photographic developing solution comprising a silver halide developing agent, an alkali and a fog-inhibiting amount of a sodium salt of 6-nitrobenzimidazole.

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