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PHOTOGRAPHIC DEVELOPER

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1 Claim. (Cl. 95-88)

The present invention relates to photographic developers and more particularly to developers comprising additions which prevent the precipitation of lime salts from the solution.

It has been proposed to prevent the precipitation of lime salts from photographic solutions, especially developers, which have a considerable content of salt and which have been prepared with water with a high content of calcium by adding to the solutions alkali metal-meta- or pyro-phosphates. This addition loses its action in solutions which are subjected to prolonged use for instance in tank developers: after a certain time separation of flocks occurs which is probably due to a slow decomposition of the phosphates and to the precipitating action of gelatin particles which may get into the tank developer during development. The flocculation of lime sediments from the solutions can of course be avoided permanently by the addition of aliphatic nitrogen containing polycarboxylic acids or salts thereof. Polycarboxylic acids of this kind are for instance described in "Annalen", 122, pages 269 and 276, and "Annalen", 278, pages 231 and 234, furthermore in the German Patent No. 638,071 and in the French Patent No. 804,497. When employing developers having these additions it is sometimes possible, that by injudicious handling, especially of photographic materials with ammonia emulsions, separation of lime crystals occurs in the emulsion layer itself. Although this so-called "lime fogging" which consists of very fine crystals of calcium salts is readily soluble in strongly acid fixing baths or in dilute acetic or hydrochloric acid, the dissolution of the fogging represents a lengthy and complicated process step which is avoided by the employment of the improved developer of the present invention.

I have found that suitable mixtures of meta- or pyrophosphates with the aliphatic nitrogen containing polycarboxylic acids or their salts, if added to the developing solutions, prevent the flocculation of lime salts in the solution and the so-called "lime fogging" of the emulsion. The action of the mixture is not merely aggregative but the co-operation of the two additions results in an improvement of high practical importance since it appears that the presence of the aliphatic nitrogen containing polycarboxylic acids and their salts prevent the formation of decomposition products from meta- or pyrophosphates and thereby the formation of flocks.

It is possible to employ the compounds in question in the form of their free acids or as soluble salts, especially as alkali metal salts. The amounts which have to be employed depend upon the composition of the developer per se and of

course also on the lime content of the water used for dilution or solution. The mixtures of meta- or pyrophosphates and aliphatic nitrogenous polycarboxylic acids and their salts may be added to the concentrated developing solutions or also to the commercial dry mixtures of the development chemicals.

The following examples serve to illustrate the invention without, however, limiting the scope thereof to the specific details set forth therein.

Example 1

To a developer of the following composition:

1-methylamino-4-hydroxybenzenesulfate	grams	4	15
Sodiumsulfite cryst	do	40	
Sodiumcarbonate	do	20	
Potassium bromide	gram	0.4	
Water	cc	1000	

there are added either in solution or to the solid mixture of chemicals 1.5 grams of sodium hexametaphosphate and 2.5 grams of trimethylamine tricarboxylic acid.

Example 2

A developer of the following composition:

1-methylamino-4-hydroxybenzenesulfate	gram	1	25
Hydroquinone	grams	6	
Sodiumsulfite cryst	do	52	
Potassium carbonate	do	30	
Potassium bromide	gram	1	30
Water	cc	1000	

there are added either to the solution or to the mixture of the solids 0.5 gram sodium hexametaphosphate and 1.5 grams tetramethyldiaminomethane-tetracarboxylic acid.

Example 3

To a developer of the following composition:

Hydroquinone	grams	3	40
Sodiumsulfite sicc	do	60	
Sodiumcarbonate	do	2	
Sodiumtetraborate	do	4	
Potassium bromide	gram	0.2	
Sodium salt of citric acid	grams	3	45

there are added 2 grams of sodium hexametaphosphate and 2 grams di-w.w'-methylamino-diethylamine-dicarboxylic acid. For use the developer must be dissolved in 1000 cc. of water.

I claim:

A photographic developer comprising a developing agent, an effective amount of an alkali metal salt of an acid selected from the group consisting of meta-phosphoric acid and pyrophosphoric acid and an effective amount of an aliphatic nitrogen containing polycarboxylic acid.

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