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DESCUMMING PREPARATION AND PROCESS

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This invention relates to improvements in etching methods and means and refers more particularly to a novel descumming process and preparation.

Powderless etching procedure used in prior art requires the preparation of the plate by the use of cold top or polyvinyl alcohol resists; the pinholes in the negative are opaqued and the plate is fully exposed and developed. Thereupon a cold top print is burned-in at a temperature of about 400 to 425° F. by the use of a suitable dye developer. This process will build a shoulder on anything in the print, including barely visible traces of printing scum, tiny spots of top resulting from small pinholes in the negative and particles of oxide film formed during burning-on. Consequently, it is then necessary to carry out a descumming operation by means of which any slight traces of printing scum, or any particles of oxide film formed during burning-in, are removed.

In prior art, it was considered necessary to carry out a descumming operation consisting of three steps, namely, a treatment with a permanganate descum solution, followed by a treatment with a nitric acid solution and thereupon followed by a treatment with sulfuric acid solution. It was considered that all the three steps are necessary to complete the descumming. The treatment with the permanganate descum solution required the mixing of potassium permanganate, potassium hydroxide and water and the soaking of the plate in this mixture. Then nitric acid was applied to the plate either in a sink or by means of a scrub brush or swab. Finally, sulfuric acid was applied by brushing or swabbing. The three preparations had to be applied consecutively and required a substantial amount of time and work.

An object of the present invention is to eliminate the drawbacks of prior art methods through the provision of a descumming operation which consists of a single step instead of the three steps required in prior art, and which is just as effective, and in many instances more effective, than the lengthy and complicated prior art operations.

Another object of the present invention is the provision of a single descumming preparation as a substitute for the three preparations required for descumming procedures in prior art, said single preparation being at least as effective as the three preparations used in prior art procedures.

Other objects of the present invention will become apparent in the course of the following specification.

The present invention is based substantially upon my discovery that ammonium persulfate can be used most effectively for the descumming of printed plates as a substitute for the consecutive use of permanganate descum solution, nitric acid solution and sulfuric acid solution, applied in that order to plates in prior art for descumming purposes.

I have also found that through the use of ammonium persulfate according to my invention, the undesirable shoulders produced as the result of the etching down of the metal by nitric acid in prior art methods, are entirely eliminated.

While in accordance with the present invention ammonium persulfate can be used alone for descumming purposes, I have found that better results are attained if an aqueous ammonium persulfate solution is mixed with a small amount of nitric acid. I have also found

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that the results are still further improved if nitric acid is replaced by sulfuric acid.

A detailed description of the preparation and process of the present invention is as follows:

A plate is initially prepared in the usual manner, for example, in a standard powderless etching machine. The process which is preliminary to descumming is carried out in the usual manner. The plate is fully exposed and fully developed. The cold top print is burned-in just under the point where the dye starts to fade, at a temperature ranging between 400° F. and 425° F. Polyvinyl alcohol resists may be also used, although they require a higher burn-in temperature. The plate is then made ready for the descumming operation.

Since the above procedure is known in the art, it is not described here in greater detail.

In accordance with the present invention, ammonium persulfate having the following characteristics is used for the descumming:

Its formula is $(\text{NH}_4)_2\text{S}_2\text{O}_8$; molecular weight: 228.20; persulfuric acid: 85.07%; NH_3 : 14.93%; available oxygen: 7.01%; assay 95 to 98%; it is odorless and decomposes at 120° C. and slowly at ordinary temperatures. Ammonium persulfate consists of crystals or white crystalline or granular powder; it is soluble in 1.5 parts of water; the solution is acid and slowly decomposes with the evolution of oxygen.

While the following examples of descumming preparations are not intended to limit the scope of the present invention, they constitute a part of and a further development of the basic idea of the present invention:

EXAMPLE 1

From 25 gr. to 600 gr. of ammonium persulfate are mixed with 1 gal. of water.

The solution is ready for use immediately following the mixture.

As already stated, this preparation, while workable, is not as effective as the ones described herein below.

EXAMPLE 2

From 25 gr. to 600 gr. of ammonium persulfate are mixed with water in an amount ranging from 1 gal. to 5 gal. Then from 25 mls. to 100 mls. of nitric acid are added to the mixture.

The mixture is immediately ready for use.

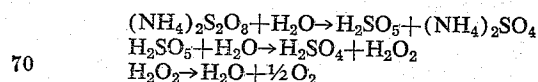
EXAMPLE 3

It was found after lengthy experimentation that best results are obtained by the use of sulfuric acid instead of nitric acid. Ammonium persulfate in an amount ranging from 25 gr. to 600 gr. is mixed with water in an amount ranging from 1 gal. to 5 gal. Then concentrated sulfuric acid the amount of which ranges from 25 mls. to 400 mls. is added to the solution. The mixture is immediately ready for use, while reaction takes place between ammonium persulfate and sulfuric acid.

The reaction may proceed as a simple hydrolysis to Caro's acid, H_2SO_5 and ammonium sulfate. Caro's acid is unstable in aqueous solution and further hydrolyses to sulfuric acid and hydrogen peroxide. The initial amount of sulfuric acid acts as a catalyst and accelerates the reaction.

It was found that the greater the amount of sulfuric acid, the faster and more vigorous the reaction. Hydrogen peroxide can decompose to water and oxygen.

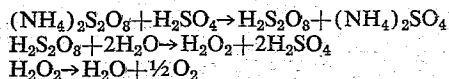
The reaction mechanism is as follows:



However, the reaction can also proceed as one in which

persulfuric acid, $\text{H}_2\text{S}_2\text{O}_8$, is formed, which decomposes to hydrogen peroxide.

The reactions are then as follows:



The reactions actually taking place depend upon a number of factors. In cold solutions very little or no hydrogen peroxide will be formed while at higher temperatures a greater amount of hydrogen peroxide will be produced. At still higher temperatures hydrogen peroxide decomposes to water and oxygen. The yield of hydrogen peroxide and oxygen also depends upon the pressure under which the reaction takes place. Furthermore, the rate of the reaction is dependent upon the concentration of sulfuric acid and the temperature at which the reaction takes place.

For the purposes of the present invention, however, the mixing of ammonium persulfate with water and the adding of sulfuric acid to the mixture take place at ordinary room temperatures and at normal prevailing pressure.

EXAMPLE 4

After lengthy experimentation, the following specific preparation was found to be most effective for descumming:

189 gr. ammonium persulfate
230 mls. concentrated sulfuric acid
3 lit. water

Ammonium persulfate is dissolved in water and then the concentrated sulphuric acid is added thereto.

Then the preparation is ready for use.

The theoretical yield of the mixture is 26.8 gr. hydrogen peroxide, 12.6 gr. oxygen and 104 gr. $(\text{NH}_4)_2\text{SO}_4$.

Method of Use

Any and all of the above described solutions are used for descumming in the following simple manner:

A plate which may consist of zinc, copper, steel or any other suitable metal is prepared in the usual way.

Then a small amount of the solution prepared in accordance with the present invention is poured over the plate.

Then a swab is used to brush the solution gently over the plate.

Then the solution is rinsed off and the plate is ready for etching.

I have found that this single operation, when used to replace the three operations required in prior art, is most effective in removing all visible printing scum and developing stains, and results in a perfectly clear plate which will produce an excellent etching.

An additional advantage of this process over prior art is that it does not etch down the metal, leaving undesirable shoulders, as is the case with prior art methods.

While the above described preparations have been indicated as suitable for the descumming process in etching, they may be also useful as oxidizers and bleachers, to remove hypo in photography, in dyeing, manufacture of aniline dyes, deodorizing and decolorizing of oils, electroplating, washing of infected yeast, removal of pyrogallol

stains, making soluble starch, depolarizer in electrical batteries and in analytical work.

In general, the above described preparations and methods are capable of many variations and modifications within the scope of the present invention. All such variations and modifications are to be included within the scope of the present invention.

What is claimed is:

1. In combination with the process of developing a photographic plate and thereafter etching said plate, the intermediate process of removing the scum formed by the developing from the developed plate prior to the etching step, said descumming process consisting of a single treatment of the printed plate by a single preparation consisting essentially of an aqueous solution of ammonium persulfate, said treatment consisting of the steps of preparing the aqueous solution of ammonium persulfate, pouring the solution upon the plate, spreading the solution over the printed surface of the plate, and then rinsing off the solution.

2. In combination with the process of developing a photographic plate and thereafter etching said plate, the intermediate process of removing the scum formed by the developing from the developed plate prior to the etching step, said descumming process consisting of a single treatment of the printed plate by a single preparation consisting essentially of an aqueous solution of ammonium persulfate mixed with an acid selected from the class consisting of nitric acid and sulfuric acid, said treatment consisting of the steps of preparing the aqueous solution of ammonium persulfate, mixing said solution with an acid selected from the class consisting of nitric acid and sulfuric acid in a proportion of solution to acid of about 100:1, pouring the mixture upon the plate, spreading the mixture over the printed surface of the plate, and then rinsing off the mixture.

3. In combination with the process of developing a photographic plate and thereafter etching said plate, the intermediate process of removing the scum formed by the developing from the developed plate prior to the etching step, said descumming process consisting of a single treatment of the printed plate by a single preparation consisting essentially of an aqueous solution of ammonium persulfate mixed with sulfuric acid, said treatment consisting of the steps of mixing 25 gr. to 600 gr. of ammonium persulfate with 1 gal. to 5 gal. of water, adding to the mixture 25 mls. to 400 mls. sulfuric acid, pouring the resulting mixture upon the plate, spreading the mixture over the printed surface of the plate, and then rinsing off the mixture.

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