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GRAINING ZINC OFFSET PLATES

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This invention pertains to the graining of zinc offset plates and more particularly to the chemical graining of such plates by the use of solutions containing hydrogen peroxide.

Zinc plates are used on a very large scale in the lithographic or offset process of printing. These plates are ordinarily produced by rolling from ingots and the metal composition of such zinc plates is usually about 99% zinc with relatively very minor amounts of other metals to control the mechanical properties of the plate. These plates are usually supplied to the printing trade with a high finish produced by rolling and sometimes subsequent belt polishing. This high finish is necessary because the plate to be useful in offset printing must have a plane surface.

The smooth sheets of zinc as supplied must be roughened for use in offset printing. This roughening or graining of the surface is necessary because the non-image area on the finished plate ready for printing must be made receptive to water, for which the smooth plate has little affinity. Furthermore, a certain amount of grain is required to promote adhesion of the photosensitive layer put on the plate to receive the image to be printed.

A basic requirement of offset printing processes is the differentiation between image and non-image areas of the plate. The image areas must be ink-receptive and are provided by the remaining parts of the photosensitive layer which represent the image. The non-image areas from which, in the course of preparing the plate, the photosensitive layer has been removed must be receptive to water. The success of offset printing relies largely on a clean delineation of these two areas and this in turn relies primarily on a proper grain of the zinc plate. It is furthermore important that the grain be fine and clear to reproduce the image clearly and sharply which is particularly important in the printing of halftones.

At present, zinc plates are grained by various mechanical methods. Ordinarily the plates to be grained are fastened in a horizontal position on an oscillating table and the grain is produced by the abrasive action of a suitable abrasive which is rubbed over the plate by means of steel balls rolling across the plate under the oscillating action of the machine. Mechanical graining has various disadvantages. The equipment used is of low production capacity because each graining machine can hold only one plate at a time and because graining time is quite extended, usually being one hour more or less. Furthermore, mechanical graining is apt to give variations in the grain produced so that reproducible results can be obtained only with difficulty. Still another difficulty in the use of mechanically grained plates is caused by minute particles of the abrasive used which frequently remain imbedded in the plate surface.

In view of the fact that desirably grained surface resembled an etched surface, chemical graining or etching with acids able to attack the zinc would seem feasible. However, the action of such acids on the zinc, although resulting in chemical attack and corrosion, does not produce the fine and uniform grain required for successful offset printing.

It has been found, in accordance with the present invention, that a highly satisfactory, fine and reproducible uniform grain can be produced on zinc offset plates if these plates are treated with an aqueous solution containing hydrogen peroxide and a mineral acid. This grain is produced by simple immersion of the zinc plate into the treating solution. The treatment is ordinarily carried out at room temperature or slightly above and for periods ranging from about ½ to about 15 minutes. This chemical graining process offers the substantial advantages of producing a reproducible fine grain using simple equipment of high capacity and producing the desired results in very short periods of time.

The chemical graining solutions of this process contain an acid, hydrogen peroxide and water. Mineral acids are satisfactory in general, but we prefer to use sulfuric acid or phosphoric acid. Hydrochloric acid does not function as well in this process because of its interaction with hydrogen peroxide present which can lead to the development of chlorine.

Although peroxygen compounds which release hydrogen peroxide when dissolved in water, may be employed in the present invention, as for instance sodium percarbonate, sodium carbonate peroxide and others, it is preferred in practicing the invention to use commercial hydrogen peroxide itself in order to avoid accumulation of salts in the bath.

This graining solution can be applied successfully to all types of zinc offset plates. These plates do not have to be prepared in any special way before graining, but it is advisable to degrease the plates in a conventional manner prior to treatment to insure uniform wetting of the plate by the graining solution.

The graining process is carried out by immersing the plate into the graining solution. Treatment time is ordinarily between about ½ to about 15 minutes, depending on the composition and condition of the zinc plate. Although lithographic zinc plates are essentially composed of zinc with very minor percentages of other metals, variations in the percentage of foreign metals present in the zinc will have an effect on the rate at which graining can be carried out. Graining rate may also depend to an extent on the original surface finish of the plate.

Ordinarily the treatment will be carried out at room temperature but if it is desired to accelerate the rate of the reaction, the bath temperature may be raised somewhat. Generally speaking, bath temperature is not critical.

A typical graining solution as used in our process will contain in aqueous solution about 1 to 5% of the mineral acid and about 1 to 10% hydrogen peroxide 100%, the percentage being upon a weight basis. Generally the sulfuric acid in the aqueous bath will be from about 1 to 2%, while about 3 to 5% phosphoric acid gives best results.

The following examples will serve to illustrate the principle of the invention:

Example 1

A sheet of engravers zinc (nominal composition 0.15% lead, 0.014% iron, 0.15% cadmium, 0.005% copper, 0.005% magnesium) was degreased by rinsing with isopropyl alcohol followed by a water rinse and then immersed for 2 minutes at room temperature in a solution containing approximately 0.7% by weight of sulfuric acid and approximately 8.8% by weight of hydrogen peroxide 100%. The sheet was withdrawn, rinsed with water and air dried. The sheet showed a fine light colored uniform grain on which water spread easily, indicating good water receptivity.

Example 2

Another sheet of engravers zinc was treated exactly as described in Example 1, with a solution containing approximately 1.5% of sulfuric acid by weight and approximately 7% of hydrogen peroxide 100% by weight. Treatment was for a half minute at room temperature. After rinsing and air drying, the sheet showed a fine light-colored uniform grain on which water spread easily, indicating good water receptivity.

Example 3

A sheet of lithographic zinc (nominal composition 0.15% lead, 0.017% iron, 0.15% cadmium, 0.005% copper) was degreased, rinsed and treated for 12 minutes at room temperature in a solution containing about 1.3% sulfuric acid by weight and about 7% hydrogen peroxide 100% by weight. After rinsing and air drying, the sheet showed a fine light-colored uniform grain on which water spread easily, indicating good water receptivity.

Example 4

A sheet of engravers zinc (nominal composition 0.15% lead, 0.14% iron, 0.15% cadmium, 0.005% copper, 0.005% magnesium) was degreased, rinsed and then treated for one minute at room temperature in a solution containing about 0.75% of sulfuric acid by weight and about 0.8% hydrogen peroxide 100% by weight. After rinsing and air drying, the sheet showed enough of an extremely fine grain on which water spread easily, indicating good water receptivity.

Example 5

Another sheet of lithographers zinc was degreased, rinsed and then treated about 10 minutes at room temperature in a solution containing approximately 4.5% phosphoric acid by weight and approximately 1.2% hydrogen peroxide 100% by weight. After rinsing and air drying, the sheet showed a fine light-colored uniform grain on which water spread easily, indicating good water receptivity.

As shown by the examples, the composition of the graining solution can be varied over a considerable range of chemical concentrations. More concentrated solutions will produce a deeper grain and will work more quickly than more dilute solutions which would tend to produce a more shallow grain and which work more slowly. Although solutions containing as little as about 0.75% sulfuric acid and about 0.8% hydrogen peroxide 100% will produce a water receptive grain, somewhat more concentrated solutions will ordinarily be preferred.

The process of this invention is also applicable to the regraining of used zinc offset plates after the ink receptive image areas present on the used plates have been removed in a conventional manner.

The zinc plates grained by the procedure described in the preceding examples were used for commercial offset printing and produced excellent prints with clear halftones.

What is claimed is:

1. A process of chemically graining cold rolled alloy zinc offset plates which comprises treating the plate with an aqueous solution comprising 1 to 5% sulfuric acid and 1 to 10% hydrogen peroxide by weight.

2. A process for chemically graining cold rolled alloy zinc offset plates which comprises treating the plate for a time of from about ½ to about 15 minutes with an aqueous solution, comprising from about 1 to 2% sulfuric acid by weight and from about 1 to 10% hydrogen peroxide 100%, by weight.

References Cited in the file of this patent

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