1 PROCESSING SOLUTIONS AND THEIR EFFECTS

OVERVIEW OF PROCESSING *KODAK EKTACHROME* FILMS

KODAK EKTACHROME films are reversal, subtractive color materials. When properly exposed and processed, they yield positive color images, i.e., transparencies.

The general structure of EKTACHROME Films is shown in Figure 1-1, enlarged to show detail. The transparent film support is at the bottom of the illustration. Reversal films contain three emulsion layers that are light-sensitive. The red-sensitive emulsion layer is located at the bottom of the film closest to the support material. The green-sensitive layer is located in the middle, and the blue-sensitive layer is at the top. Although the red-sensitive layer is primarily sensitive to red light and the green-sensitive layer is primarily sensitive to green light, both of these layers are somewhat sensitive to blue light. The yellow filter layer absorbs blue light and prevents blue light from exposing the red- and green-sensitive layers.

When reversal film is exposed, latent images are formed in each of the three emulsion layers. The blue-sensitive layer contains a record of the images formed by the blue component of the exposing light; the green-sensitive layer contains the image formed by the green component; and the red-sensitive layer contains the image formed by the red component. The images are formed simultaneously and are superimposed.

Figure 1-2 shows the formation of the color image during processing. For more information about each processing step in Process E-6, see the descriptions on page 1-2.

Figure 1-1

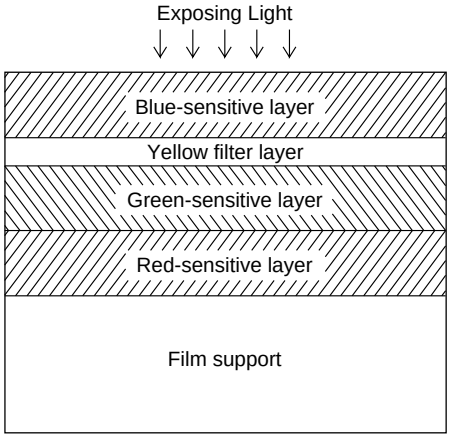

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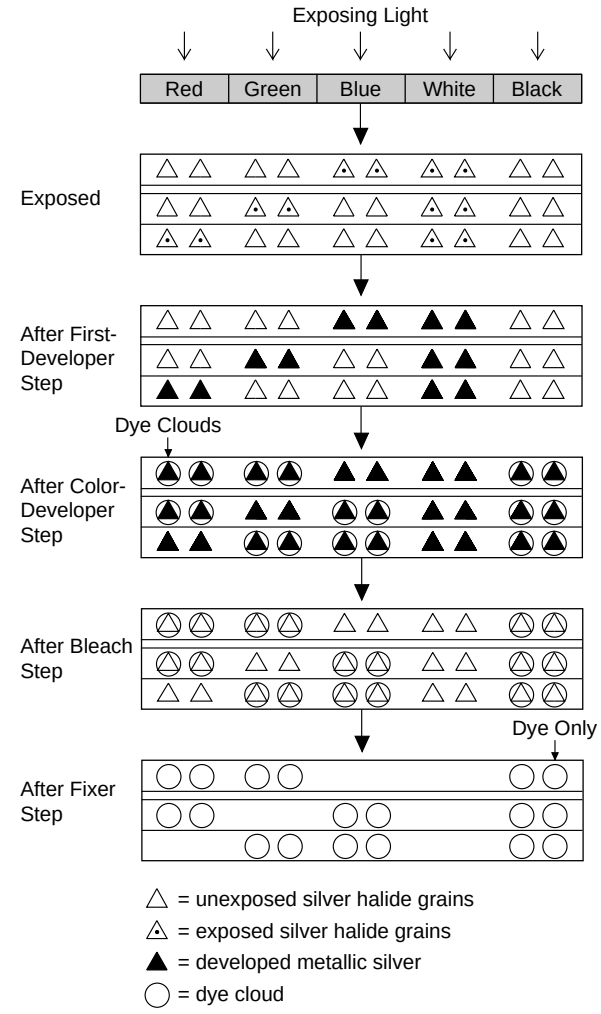
Figure 1-2



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PROCESS E-6

Understanding Solution Functions

Use the following descriptions to become familiar with the function of each processing solution. This understanding, along with the information in section 14, "Diagnostic Charts," and section 15, "Control-Chart Examples," will help you analyze process problems.

First Developer

The chemical reducing action of the first developer converts exposed silver halide grains (the latent image) into metallic silver (the silver image). This is a negative image. The first developer step is the most critical step of Process E-6. The amount of silver formed depends on developer activity.

Time, temperature, agitation, developer concentration, and utilization affect first-developer activity. In Process E-6, increased first-developer activity causes too little dye to form; decreased activity causes more dye than normal to form.

First Wash

The first wash stops the action of the first developer and removes first developer solution from the film. Insufficient water flow, incorrect temperature, or too little wash time will affect density (speed) and color balance.

Reversal Bath

The reversal bath prepares the film for the color-developer step. A chemical reversal agent is absorbed into the emulsion and prepares the remaining silver halide for the chemical reversal that occurs in the color developer. Do not use a wash between the reversal bath and the color developer; the reversal agent must be in the emulsion when the film enters the color developer.

Incorrect replenishment, excessive oxidation, incorrect mixing, and utilization can affect overall density and color balance.

Color Developer

When film enters the color developer, the reversal agent absorbed by the emulsion in the reversal bath chemically "exposes" the remaining silver halide. The color developing agent then reacts with the silver halide to form metallic silver. As this metallic silver image is formed, the oxidized color developer agent reacts with the color couplers in each of the three dye layers (yellow, magenta, and cyan) of the film to form colored dyes. The dye forms only at the sites where the image was converted to metallic silver.

Changes in the color developer pH, agitation, time, temperature, developer concentration, utilization, and replenishment rate affect color balance, contrast, maximum density, minimum density, and uniformity.

Pre-Bleach

The pre-bleach prepares the metallic silver developed in the first and color developers for oxidation to silver halide in the bleach step. It helps preserve the acidity of the bleach solution by reducing carryover of color developer into the bleach. The pre-bleach also enhances dye stability. Pre-bleach that is too concentrated can cause leuco-cyan dye to form, resulting in low red D-max. If the pre-bleach is too dilute, the dye stability could be substandard. Do not use a wash between the pre-bleach and the bleach; pre-bleach carry-in is necessary for proper bleaching.

Bleach

The bleach converts the metallic silver image back to silver halide; the silver halide is later removed in the fixer.

During bleaching, iron III is reduced to iron II. Iron II must be converted back to iron III by aeration so that satisfactory bleaching can continue. Aerate the bleach by bubbling air through it.

Inadequate aeration, underreplenishment, too little time, low temperature, and over-dilution by pre-bleach can cause silver retention, low red D-max, high blue D-max (and to a lesser degree, high green D-max), and yellow D-min.

Fixer

The fixer converts all of the silver halide into soluble silver compounds. Most of the silver compounds are removed in the fixer and can be recovered.

You must aerate any bleach carried into the fixer (by bubbling air into the fixer or with manual agitation) to prevent exhausted bleaching agent from causing leuco-cyan dye to form. However, too much air will oxidize the fixer; aerate the fixer only when film is in the fixer.

Too little time, underreplenishment, or fixer dilution will cause silver-halide retention, increased blue density, or yellow D-min.

Final Wash

The final wash removes chemicals remaining in the film emulsion. Complete washing at this stage is important for image stability; any chemicals remaining in the film may deteriorate the image dyes. For best results, use a 2-stage countercurrent-flow wash.

Final Rinse

The final rinse contains a wetting agent to reduce water spotting and provide uniform drying. To help prevent water spots and streaks, maintain solution cleanliness by replacing the final rinse once a week or more frequently.