

# Using KODAK Chemicals in Minilabs

This publication is written especially for minilab operators. It provides the most commonly used technical information about film and paper processes for minilabs. Using KODAK FLEXICOLOR Chemicals and KODAK EKTACOLOR PRIME or EKTACOLOR RA Chemicals in your minilab ensures that you are using chemicals that provide optimum results with the least environmental impact possible.

This publication describes the processing cycles recommended for processing KODAK GOLD, MAX, ROYAL GOLD, and ADVANTIX Films; and KODAK EKTACOLOR Edge and ROYAL Papers in minilabs. *This manual is divided into three sections:*

- Chemicals and Chemical Handling
- Processing Cycles for KODAK Chemicals
- Process Monitoring and Troubleshooting

**Note:** If you are using KODAK SM Chemicals, see KODAK Publication No. Z-101, *Using KODAK SM Chemicals in SM Minilabs*.





### CHEMICALS AND CHEMICAL HANDLING

High-quality customer orders begin with proper chemical handling and your choice of chemicals. Chemical handling includes how you store and mix chemicals and your attention to chemical safety.

*This section describes:*

- Chemical terms
- Processing solution effects
- Choosing chemicals for your minilab
- Safe handling of photographic chemicals
- Chemical mixing
- Checking chemicals
- Solution storage
- Compensating for evaporation
- How to clean tanks and racks
- How to dispose of effluent and chemicals
- Solid waste disposal

### Chemical Terms

To help you understand the terms we've used to describe the chemicals in this manual, here are some definitions:

**Chemical Concentrates or Concentrates**—Chemicals that are used to make tank solutions or to replenish tank solutions.

**Fresh Solution**—Newly mixed, unused solution.

**Replenisher**—Solution used to restore the chemical components of the tank solution to maintain photographic performance over time.

**Seasoned Solution**—A tank solution that has been used and replenished for a period of time. The chemical components and seasoning by-products of a seasoned solution are at an optimum level for processing.

**Starter**—Solution added to diluted chemical concentrates to prepare a fresh tank solution so it yields results similar to those provided by a seasoned tank solution.

**Tank Solution**—The solution used in the processor tank; often referred to as “working solution.”

## How Each Processing Solution Affects Your Results

Each solution affects the film or paper differently. Understanding the reaction of each solution can help you diagnose processing problems.

**Developer**—The developer chemically reduces the exposed silver halide in the film or paper to form a metallic silver image. At the same time, the color developing agent in the developer oxidizes and combines with the dye couplers at the site of the silver image in each of the dye-forming emulsion layers to form a color image. Once the dye image has formed, there is no need for the silver image. It is removed by bleaching and fixing.

The amount of cyan, magenta, and yellow dye formed depends on exposure and developer activity. Temperature, time, replenisher concentration, replenishment rate, agitation, and the rate at which solutions diffuse into the emulsion affect developer activity. Time, temperature, and agitation affect the diffusion rate. With *too much* developer activity, too much dye forms; with *too little* activity, not enough dye forms.

**Bleach**—In the film process, the bleach stops developer activity and converts metallic silver into silver halide. The silver halide is dissolved in the fixer.

Bleach concentration and the rate at which the solution diffuses into the emulsion affect bleach activity. Time, agitation, and temperature affect the rate of diffusion. Replenishment rate, mixing procedures, and aeration efficiency affect the chemical concentrations. Bleach aeration adds oxygen needed to convert the reduced bleaching agent to an active form.

If bleaching is inadequate, less than the normal amount of cyan dye is formed because some of the dye remains in the leuco (colorless) condition. This affects the color balance. Bleach time that is too short, bleach that is too dilute, or insufficient bleach aeration can cause leuco-cyan dye to form.

Inadequate bleaching can also cause retained silver because not all the metallic silver is converted to silver halide. Leuco-cyan dye and retained silver adversely affect image quality, but you can correct both conditions by rebleaching and refixing the film in good solutions.

**Bleach Aeration**—In Process C-41, you must aerate the bleach to convert iron II back to iron III. If the concentration of iron II is not kept low enough, leuco-cyan dye or retained silver can form. Too much aeration can cause the bleach to foam or splash. This can contaminate other solutions or cause staining that can increase D-min densities.

**Fixer**—In a film process, the fixer converts silver halide in the film into soluble silver complexes. Most of these silver complexes remain in the fixer solution; you can recover them with electrolytic silver-recovery units, metallic replacement cartridges, and/or chemical precipitation methods. Fixing efficiency depends on fixer activity and the diffusion rate into the emulsion. Temperature, replenisher concentration, and replenishment rate affect fixer activity. Time and agitation affect the diffusion rate.

Inadequate fixing may not remove all of the sensitizing dyes and silver halide. An increase in the red and green D-min densities of the control plot is one sign of incomplete fixing. Another sign is a milky appearance in the D-min areas of control strips and processed film. If this problem occurs, you can test the fixer by refixing the control strip (or film) in a fixer that you are sure is good. If refixing the strip corrects the control plot, the original fixer is probably exhausted. You can correct inadequately fixed film by refixing it.

The most probable causes of inadequate fixing are fixer that is diluted by excessive solution carryover, an inadequate fixing time, underreplenishment (or replenisher that is underconcentrated), and fixer sulfurization. Temperature has very little effect on the fixing rate if other fixer conditions are within tolerances. Agitation is necessary primarily for uniform fixing.

**Bleach-Fix**—The paper process uses a bleach-fix instead of a separate bleach and fixer. A bleach-fix has three primary purposes: to stop the action of the developer; to convert metallic silver into ionic silver; and to dissolve the silver.

Bleach-fix performance depends on the concentration and the diffusion rate of the solution into the emulsion. Time, agitation, and temperature affect the diffusion rate. Incorrect bleach-fix conditions or an abnormal bleach-fix can affect the amount of dye formed.

Inadequate bleach-fixing may not remove all of the silver from the paper. A sign of retained silver is an increase in the black-patch (BP) densities and a desaturation of the yellow patch on the control strip (giving it a brown appearance). Retained silver degrades image quality by desaturating the colors—especially yellow—and is most apparent in higher-density areas where there is more retained silver. You can remove retained silver by reprocessing the paper in a good bleach-fix.

**Final Rinse**—In a film process, the final rinse step promotes uniform drying, and reduces water spotting. In minilabs that use a washless film or paper process, the final rinse is used (instead of a wash step) to remove residual chemicals from film or paper.

**Stabilizer**—In a paper process, the stabilizer allows for low washing rates and maintains a cleaner working solution to avoid dirt and stain formation on the prints.

**Wash**—Most minilabs operate without a wash step; however, some older minilabs use wash water to remove residual chemicals from film or paper. Good washing requires enough circulation to keep fresh water in contact with the emulsion. The water temperature must be warm enough to swell the gelatin so the water moves freely into the emulsion to remove the chemicals, but not so warm that it damages the emulsion. A thorough final wash is necessary because chemicals that remain in the film or paper can cause dyes to fade.

**Choosing the Right Chemicals for Your Process**

Kodak is committed to providing minilabs with chemicals that are safe, economical, and easy to use. The chemicals designed for minilabs are supplied in liquid concentrates for easy mixing and handling; they are available in convenient and economical sizes. Kodak designs these chemicals to be as safe as possible for our environment.

**KODAK FLEXICOLOR Chemicals for Minilab Film Processors**

Features	Benefits
<ul style="list-style-type: none"><li>• Low developer replenishment rates with FLEXICOLOR Developer Replenisher LORR</li></ul>	<ul style="list-style-type: none"><li>• Less mixing</li><li>• Less effluent discharged—less environmental impact</li><li>• Chemical savings</li></ul>
<ul style="list-style-type: none"><li>• FLEXICOLOR Bleach III NR Replenisher provides efficient bleaching</li></ul>	<ul style="list-style-type: none"><li>• Greater bleaching safety factor</li><li>• Virtually eliminates retained silver problems</li><li>• Reduced environmental impact</li></ul>
<ul style="list-style-type: none"><li>• All-liquid concentrates</li></ul>	<ul style="list-style-type: none"><li>• Easy mixing</li></ul>
<ul style="list-style-type: none"><li>• Rapid access cycle time available with FLEXICOLOR RA Chemicals for some minilabs</li></ul>	<ul style="list-style-type: none"><li>• Faster turnaround time for customer orders</li></ul>
<ul style="list-style-type: none"><li>• FLEXICOLOR RA Bleach Replenisher NR is odorless</li></ul>	<ul style="list-style-type: none"><li>• Better workplace environment</li></ul>
<ul style="list-style-type: none"><li>• Washless cycle available</li></ul>	<ul style="list-style-type: none"><li>• No water or sewer hookup required</li><li>• Water and energy costs savings</li></ul>
<ul style="list-style-type: none"><li>• Formulated to provide excellent performance when mixed with a variety of water supplies</li></ul>	<ul style="list-style-type: none"><li>• Quality of local water supply not critical</li></ul>
<ul style="list-style-type: none"><li>• Available in a wide variety of sizes</li></ul>	<ul style="list-style-type: none"><li>• Sizes convenient for all users</li></ul>



Kodak packages the following FLEXICOLOR Chemicals in convenient sizes for minilabs. For information on process cycles and production volume, see page 27.

KODAK Chemical	Process Cycle	Sizes to Make*	Comments
FLEXICOLOR Developer Replenisher LORR	C-41B, C-41RA, C-41	5 L, 10 L, 25 gal (two 12½ gal sizes)	Low replenishment rate helps reduce effluent discharged by as much as 50 percent; less chemical mixing and lower cost per roll of film processed.
FLEXICOLOR Developer Starter LORR	C-41B, C-41RA, C-41	31.5 L (8.3 gal) of tank solution	Use with FLEXICOLOR Developer Replenisher LORR to prepare a fresh tank solution.
FLEXICOLOR Bleach III NR Replenisher	C-41B, C-41	5 L	Reduced cost per roll of film; reduced replenishment rates and volume of effluent discharged.
FLEXICOLOR RA Bleach Replenisher NR	C-41RA, C-41	5 L	Use <b>only</b> with minilabs designed for Process C-41RA. Requires no mixing; packaged ready-to-use; odorless.
FLEXICOLOR Bleach Starter	C-41B, C-41RA, C-41	31.5 L (8.3 gal) <sup>†</sup> or 75.7 L (20 gal) <sup>‡</sup> of tank solution	Use with FLEXICOLOR Bleach III NR Replenisher or FLEXICOLOR RA Bleach Replenisher NR. Odorless, non-corrosive, and non-foaming.
FLEXICOLOR Fixer and Replenisher	C-41B, C-41	5 L, 5 gal, 25 gal	Use to make a replenisher or tank solution.
FLEXICOLOR RA Fixer and Replenisher	C-41RA	5 L, 10 L	Use <b>only</b> with minilabs designed for Process C-41RA. Use as a replenisher or tank solution.
FLEXICOLOR Stabilizer and Replenisher LF	C-41B, C-41RA, C-41	5 L, 10 L, 12½ gal, 75 gal	Contains a stabilizing agent that produces only trace levels of formaldehyde. Use in minilabs that operate with a wash or washless cycle.

\* Sizes listed are available in the U.S. and Canada. Other regions may supply these chemicals in different sizes; for more information, contact Kodak in your country.

<sup>†</sup> From FLEXICOLOR RA Bleach Replenisher NR.

<sup>‡</sup> From FLEXICOLOR Bleach III NR Replenisher.

KODAK EKTACOLOR Chemicals for Minilab Paper Processors

Features	Benefits
<ul style="list-style-type: none"><li>• Fast access time</li><li>• Low replenishment rates</li></ul>	<ul style="list-style-type: none"><li>• Quicker results from printer tests</li><li>• Fewer mixes</li><li>• Less effluent discharged — less environmental impact</li><li>• Chemical and cost savings</li></ul>
<ul style="list-style-type: none"><li>• Lower water usage</li></ul>	<ul style="list-style-type: none"><li>• Reduced water and energy costs</li><li>• Less effluent discharge</li></ul>
<ul style="list-style-type: none"><li>• Can be used with a washless cycle</li></ul>	<ul style="list-style-type: none"><li>• Additional water and energy savings; smaller amounts of effluent discharged</li></ul>
<ul style="list-style-type: none"><li>• Greater process stability</li></ul>	<ul style="list-style-type: none"><li>• Consistent, repeatable print quality over a broad range of processor production volumes</li><li>• Less need to adjust for low production volume</li><li>• Fewer printer changes due to process shifts</li></ul>
<ul style="list-style-type: none"><li>• Contains patented preservatives that protect developing agent from oxidation</li></ul>	<ul style="list-style-type: none"><li>• Stable developer activity</li></ul>
<ul style="list-style-type: none"><li>• Good mixes with a variety of water supplies</li></ul>	<ul style="list-style-type: none"><li>• Quality of local water supply not critical</li></ul>
<ul style="list-style-type: none"><li>• Contains stain-reducing agent</li></ul>	<ul style="list-style-type: none"><li>• Clean, crisp whites in prints</li></ul>

Kodak packages the following EKTACOLOR Chemicals in convenient sizes for minilabs. For information on process cycles and production volume, see page 33.

KODAK Chemical	Process Cycle	Sizes to Make*	Comments
EKTACOLOR PRIME SP Developer Replenisher LORR	RA-4	10 L, 10 gal	For minilabs with medium- to high-production volume. Reduced replenishment rate.
EKTACOLOR PRIME SP Developer Replenisher	RA-4	10 L, 10 gal	For minilabs with low-production volume.
EKTACOLOR RA Developer Replenisher RT	RA-4	5 L, 10 L, 25 gal	For minilabs with very low-production volume. For minilabs with roller-transport design. Formulated to minimize the effects of low-production volume.
EKTACOLOR RA Developer Starter	RA-4	Available as a 1-L concentrate	Use with KODAK EKTACOLOR PRIME SP Developer Replenisher, EKTACOLOR PRIME SP Developer Replenisher LORR, or EKTACOLOR RA Developer Replenisher RT to prepare a tank solution.
EKTACOLOR PRIME Bleach-Fix Replenisher LORR	RA-4	10 L, 12½ gal	For minilabs with medium- to high-production volume.
EKTACOLOR PRIME Bleach-Fix Replenisher	RA-4	10 L, 5 gal	For minilabs with low-production volume.
EKTACOLOR RA Bleach-Fix and Replenisher	RA-4	5 L, 10 L, 25 gal	For minilabs with very low-production volume.
EKTACOLOR PRIME Stabilizer and Replenisher LORR	RA-4	10 L, 12½ gal	Use this stabilizer in place of a final wash in washless minilabs. For minilabs with medium- to high-production volume.
EKTACOLOR PRIME Stabilizer and Replenisher	RA-4	10 L, 12½ gal	Use this stabilizer in place of a final wash in washless minilabs. For minilabs with low-production volume.

\* Sizes listed are available in the U.S. and Canada. Other regions may supply these chemicals in different sizes; for more information, contact Kodak in your country.

### Safe Handling of Photographic Chemicals

Handle all chemicals carefully. For more information about potential health hazards and safe handling of specific Kodak chemicals, see the package label and the Material Safety Data Sheet (MSDS) for the chemical or call the Kodak health and safety information hotline at (716) 722-5151, 24 hours a day, 365 days a year.

**Follow Instructions Carefully**—Kodak chemical packages have precautionary information on the labels. Always follow the label instructions. Read the Material Safety Data Sheets (MSDSs) for more safe chemical handling information. If you need Material Safety Data Sheets for KODAK Chemicals in the U.S. call (800) 242-2424, in Canada call (800) 465-6325, or contact your Kodak sales representative. Please supply the catalog (CAT) numbers for the chemicals when you request MSDSs. In other regions, contact Kodak in your country. You can also obtain MSDSs on-line at: [www.kodak.com/go/kes](http://www.kodak.com/go/kes).

**Store Chemicals and Processing Solutions Safely**—Keep chemicals and processing solutions out of the reach of children and pets. **Do not** store chemicals where you handle or store food. **Do not** eat, drink, or smoke in chemical-handling areas. Always wash your hands thoroughly after handling chemicals, especially before eating or drinking.

**Label All Chemicals Properly**—In the U.S., the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard requires employers to inform employees about hazardous chemicals in the workplace. This standard requires that all containers of hazardous chemicals, including storage and processor tanks, be labeled. You can obtain self-adhesive KODAK Chemical labels for your storage and processor tanks from your Kodak price catalog (see the information in the “Chemicals” section). Downloadable versions of the labels can be found at [www.kodak.com/go/kes](http://www.kodak.com/go/kes). These labels give the chemical hazard, and the action to take in case of accidental contact. Use these labels *only* for KODAK Chemicals; use with other manufacturers’ chemicals is an incorrect use under the OSHA standard. Other countries may have similar requirements, so check with local authorities or Kodak in your country.

**Keep the Mixing Area Clean**—Clean up spilled chemicals as soon as possible with mild soap and water; wear nitrile rubber gloves and goggles. Residue from dried chemicals can become airborne and be inhaled or contaminate processing and printing areas.

**Wear Protective Equipment and Clothing**—Wear goggles or a face shield and an apron (made of PVC) and protective gloves (made of nitrile rubber) when you mix solutions. Clean protective clothing after use to remove any chemical residue that can cause contamination.

**Handle Chemicals Carefully**—Avoid contact of any chemicals with your skin; some photographic solutions, particularly developers, can cause skin irritation and an allergic skin reaction. In case of accidental chemical contact, wash your skin with running tap water and a non-alkaline (slightly acid) hand cleaner. If symptoms persists, get medical attention. There must be an eyewash station handy to all employees. The station must be capable of providing a 15-minute flush of water or eye-wash fluid at a rate of 1.5 litres/minute. All employees must know the location of the eyewash station. Follow the manufacturers' instructions for eyewash station maintenance, and inspect the unit on a routine basis as required by OSHA.

**Ventilate the Area Properly**—Some photographic chemicals and solutions give off vapors and gases. For safety and comfort, keep the concentration of these vapors and gases to a minimum. To minimize the concentration of vapors and gases, provide good ventilation (about 10 changes of room air per hour) and use covers and floating lids on all solution storage tanks (which also helps reduce evaporation and oxidation). Also, keep the processing tanks enclosed and vent the dryer according to the manufacturer's specifications.

**Additional Health and Safety Information**—If you are interested in obtaining publications from Kodak that address the subject of the Safe Handling of Photographic Chemicals you can contact Kodak Environmental Services at (716) 477-3195 or visit their website at [www.kodak.com/go/kes](http://www.kodak.com/go/kes).

### Chemical Mixing

For the most current information, follow the mixing instructions packaged with the chemicals or on the label of the chemical container. Follow all safety precautions and handling recommendations given in the instructions and in *Safe Handling of Photographic Chemicals* on page 10.

**Contamination Can Ruin a Process**—To minimize the possibility of contamination, keep processing and mixing equipment and storage containers clean. Dirt and contamination can affect the life and photographic quality of the processing solutions. Avoid conditions where solutions can come in contact with other chemicals. Small amounts of fixer or bleach-fix solution can contaminate developer solutions and cause adverse photographic effects. To lessen the possibility of contamination, thoroughly rinse and clean processing and mixing equipment and storage containers before use. Be careful not to drip solution into other tanks when you remove racks for cleaning. Wash and rinse processing and mixing equipment thoroughly before reusing it. Contamination is most often caused by—

- solution splashed or dripped into another solution
- using mixing equipment that has not been thoroughly cleaned
- dry chemicals that become airborne during mixing
- pipes and tanks made of material that reacts with the photographic chemicals

### Checking Chemicals

Fresh FLEXICOLOR and EKTACOLOR Chemical concentrates and solutions have a characteristic appearance and odor. By checking the appearance and odor, you may be able to determine if a concentrate was stored properly or if a solution was mixed correctly. The tables on pages 13 and 15 summarize the characteristics of FLEXICOLOR and EKTACOLOR Chemicals and solutions.

**Characteristics of KODAK FLEXICOLOR Chemical Concentrates**

<b>Chemical</b>	<b>Part</b>	<b>Normal Appearance</b>	<b>Comments</b>
Developer Developer Replenisher Developer Replenisher LORR	A	Clear, colorless to very pale yellow; odorless	A crystalline precipitate may appear in parts that are kept too long (more than 2 years) and/or exposed to cold temperatures. If color and odor are normal, Part A is usable if the crystalline material dissolves upon mixing. Extended mixing and heat may be needed before adding Parts B and C. However, be sure mixture is no warmer than 38°C (100°F) when Part C is added.
	B	Clear, colorless; odorless	
	C	Clear; color varies from light yellow to yellow	The color range described is due to different levels of sulfite. Absence of sulfur dioxide odor means the preservative is exhausted. If the solution turns color or becomes opaque, or if there is a precipitate, do not use it.
Developer Starter Developer Starter LORR		Clear, colorless to very pale yellow; faint odor	
Bleach III NR		Greenish-yellow; slight ammonia odor	When the solution is exposed to temperatures below 4°C (40°F), a green-brown precipitate may form. This material is the bleaching agent; it should dissolve at room temperature.
RA Bleach NR		Dark yellowish-green; odorless	When the solution is exposed to temperatures below 4°C (40°F), a green-brown precipitate may form. This material is the bleaching agent; it should dissolve at room temperature.
Bleach Starter		Clear, colorless; odorless	

<b>Chemical</b>	<b>Part</b>	<b>Normal Appearance</b>	<b>Comments</b>
Fixer RA Fixer		Clear, colorless to very pale yellow; odor of acetic acid	Age and/or exposure to high temperature can cause sulfurization. When a white to light yellow sediment forms, the solution becomes more yellow, and a musty odor (sulfur) is noticeable along with the acetic acid odor. Severely degraded fixers may have a large amount of precipitate and a hydrogen sulfide odor (i.e., rotten-egg odor) and may appear dark; do not use a fixer if it appears this way.
Stabilizer and Replenisher LF		Clear, colorless	



## Characteristics of KODAK EKTACOLOR Chemical Concentrates

EKTACOLOR Chemical	Normal Appearance	Comments
Developers Developer Replenisher	Yellow to yellow-brown	Darkens with age. Darkening does not affect activity when solutions are properly stored.
Bleach-Fixes Bleach-Fix Replenishers	Clear, dark red-brown to brown; slight ammonia odor	Age and/or exposure to high temperature can cause sulfurization. Severely degraded bleach-fixes have a large amount of white to yellow precipitate and may have a hydrogen sulfide odor (i.e., rotten-egg odor).
Stabilizer and Replenisher	Clear, colorless	

Solution Storage

- Store *chemical concentrates* at 5 to 30°C (40 to 86°F) in a dry location. At temperatures lower than 5°C (40°F), components may come out of solution or crystallize. Temperatures higher than 30°C (86°F) will accelerate chemical reactions and cause deterioration.
- Store *mixed solutions* in polyethylene storage tanks at approximately 21°C (70°F).
- Storing a replenisher at too high a temperature accelerates oxidation and evaporation. Storing a replenisher at too low a temperature can affect the temperature of the tank solution.
- To reduce oxidation and evaporation, use floating lids on all solutions.

For best results, *do not* use KODAK FLEXICOLOR or EKTACOLOR solutions stored longer than the times given in the table below.

Mixed Solutions	Solution in Processor—No Operation	Replenisher in Covered Tank
FLEXICOLOR Developer LORR	1 week	4 weeks
EKTACOLOR RA Developer EKTACOLOR RA Developer RT	1 week	6 weeks
EKTACOLOR PRIME Developer EKTACOLOR PRIME Developer LORR EKTACOLOR PRIME Developer Regenerator	1 week	6 weeks
All other FLEXICOLOR and EKTACOLOR solutions	2 weeks	8 weeks

## Compensating for Evaporation

When water evaporates from processing solutions, the chemical components remain and the solutions become overconcentrated. Evaporation occurs naturally to some degree, but it is more likely to occur when tank solutions are up to temperature, but no film or paper is being processed or when solutions are cooling down after shutdown. “Down-time evaporation” occurs after you shut down your processor; the level of your processing solutions is lower in the morning when you start up your process. When the process is running, there is also a slight loss of solution volume due to evaporation. With typical production volume, most replenishers deliver enough water to compensate for evaporation that may occur when the processor is running. However, if your processor operates at low production volume (as many minilabs typically do), evaporation may take place at a greater rate than what was built into the design of the replenisher solutions. You can compensate for “run-time evaporation” by topping off your solutions with water at a temperature that is close to the temperature of your tank solutions. *Never use cold water to top-off solutions.*

It is difficult to accurately estimate the amount of run-time evaporation that may occur, because minilabs generally do not have the capability of monitoring the specific gravity of processing solutions, and because there are many variables that contribute to the severity of the evaporation. Follow the procedures described on page 18 as a guide for compensating for evaporation.

1. *At daily start-up*—With the recirculation system on, check the level of the tank solutions. If the tank solution level is not up to the top of the overflow tube, add water—at approximately operating temperature—to bring the solution level up to the top of the overflow tube.

If the solution level is at the top of the overflow tube, squirt the top edges of the tank and the rollers at the top of the rack lightly with warm water to remove any buildup of dried chemicals. Do not use too much water to avoid severely diluting the tank solution.

2. *During production*—Check the level of the processing solutions at least once during the day or shift. *Check the solutions when you are not processing film or paper.* If the level of the tank solutions is lower than the top of the tank overflow tube, add warm water until the solution is at the appropriate level.

If the solution level is at the top of the overflow tube, squirt the top edges of the tank and the rollers at the top of the rack lightly with warm water to remove any buildup of dried chemicals. Do not use too much water to avoid severely diluting the tank solution.

For minilabs that process and print less than 50 rolls of film a day, repeat this step later in the day.

3. *At shutdown*—Squirt the top edges of the tank, the top of the rack, and the rollers at the top of the rack lightly with warm water to prevent the buildup of dried chemicals. Do not use too much water to avoid severely diluting the tank solution. Clean and rinse crossovers thoroughly to minimize chemical buildup.

### Cleaning Minilab Tanks and Racks

Always wear splash-proof goggles and protective gloves and apron when you clean racks and tanks.

**Routine Cleaning**—Follow the recommendations described below. **Be sure to follow your equipment manufacturer's recommendations for regular maintenance procedures.**

1. Remove crossovers, squeegee rollers, or squeegees at shutdown, and rinse them with hot water.
2. Once a week, remove each rack from the processor, clean it with hot water and a soft, non-abrasive brush, and rinse thoroughly. Inspect the racks for non-moving rollers, deformities in rollers, worn or broken springs, loose screws, deteriorated retaining clips, etc, to ensure smooth transport.
3. On a periodic basis (every 6 to 12 months), clean racks and tanks with a non-abrasive brush, and remove stains from racks and tank walls with a cleaner. Rinse racks and tanks thoroughly before you refill the tanks.

### Removing Biological Growth

Biological growth can occur in stabilizer and wash tanks, and is a potential source of dirt. Clean wash tanks weekly, and stabilizer tanks as needed. Wear protective gloves and splash-proof goggles when you follow this procedure. To remove biological growth:

1. Empty the processing solution or wash water tank. Dispose of waste solutions according to local or state disposal regulations.
2. Rinse the tanks and racks with hot water; drain the rinse water and repeat.

**DANGER!** The addition of cleaning agents that contain strong acids or oxidizing agents (e.g., chlorine-containing bleaches) to thiocyanate-containing photoprocessing solutions (i.e., some fixers), may release poisonous and flammable hydrogen cyanide gas, as well as other irritating and toxic gases, such as cyanogen chloride and sulfur dioxide. **Do not** add cleaning agents to processing tanks unless the tanks and racks have been completely drained and thoroughly rinsed with water. Read the Material Safety Data Sheet for information on the potential hazards of the working tank solution.

3. Fill the tank with a dilute sodium hypochlorite ( $\text{NaOCl}$ ) solution, such as 2 mL Clorox (5.25 percent  $\text{NaOCl}$ ) or 1 mL Sunny Sol (12.5 percent  $\text{NaOCl}$ ) per litre of water.
4. Allow the hypochlorite solution to remain in the tanks for up to 30 minutes. Longer dwell times can damage plastic or rubber materials. After

treatment, dispose of the hypochlorite solution according to local or state disposal regulations.

5. Brush foreign matter from the tanks and racks.
6. Before refilling the tanks, flush them *thoroughly* with water. Small amounts of remaining hypochlorite can have an adverse effect on processing solution activity. Be sure to recirculate rinse water through the recirculation system to remove traces of hypochlorite.

**Note:** For more information on the recommended methods for cleaning processing tanks in the U.S. and Canada, contact the Kodak Information Center at (800) 242-2424, extension 60. For information on controlling biological growth, request a copy of KODAK Publication CIS-3, *Biocides for Photographic Solution Tanks and Wash Water*.

### Disposing of Processing Effluent

Effluent from processing labs that use KODAK FLEXICOLOR and EKTACOLOR Chemicals consists of developer, bleach, desilvered bleach-fix, fixer, and stabilizer solutions and/or wash water. This effluent is compatible with and can be effectively treated by a municipal secondary wash-water treatment plant.

Photographic effluent is considered an industrial waste discharge. Most municipalities require a permit to discharge industrial waste to a municipal sewer system. After efficient silver recovery, the effluent from a minilab using Processes C-41, C-41B, C-41RA, and RA-4 has these characteristics.

Effluent from processes that use FLEXICOLOR and EKTACOLOR Chemicals will also contain concentrations of ammonia, iron, sulfates, developing agents, and chemicals that have an oxygen demand (BOD, COD). The concentrations of these chemicals will depend on factors such as replenishment and wash rates, type of processor, efficiency of squeegees, chemical regeneration, treatment methods, and the dilution of effluent from other processing effluent and non-processing wastewater. To characterize waste from your processing operation, it is best to have the effluent sampled by an analytical laboratory according to the method required by local discharge codes.

**Material Safety Data Sheets**—For more information on the chemical components of the processing chemicals that you use, see the Material Safety Data Sheets. To request MSDSs for Kodak chemicals call (800) 242-2424, in the U.S.; in Canada, call (800) 465-6325. In other regions, contact Kodak in your country. Please supply the catalog (CAT) numbers for the chemicals when you request MSDSs.

You can also obtain MSDSs on-line at: [www.kodak.com/go/kes](http://www.kodak.com/go/kes).

**Reduce Processing Effluent**—Keep the discharge of photographic chemicals as low as possible by using efficient squeegees and the correct replenishment rates. Avoid making batch discharges, such as tank dumps. If your permit allows, discharge large amounts of working-strength solutions by adjusting the pH and then releasing them slowly into the sewer along with your normal non-processing effluent. To adjust the pH, combine high pH solution (developer) with low pH solutions (bleach, desilvered bleach-fix, or desilvered fixer) to neutralize the pH of the solution.

Consider silver recovery as part of your normal processing operation. For more information on silver-recovery, see KODAK Publication No. J-208, *Introducing the “Silver Management” Series*. For more information on silver recovery from Process RA-4, see *Silver Recovery* on page 25.

**Other Effluent Disposal Methods**—Although most labs discharge their effluent to a municipal waste-water treatment plant, sewer use discharge restrictions or lack of access to a treatment plant may require some labs to use an off-site disposal (haulaway) service, such as the KODAK RELAY Program.

In this program, you can have your processing effluent removed by a licensed waste transportation and disposal company. The KODAK RELAY Program is a service for customers who use Kodak photographic chemicals, and is offered in conjunction with the Safety-Kleen Corporation. To participate in the RELAY Program, call Kodak Environmental Services at (716) 477-3194.

*Septic-Tank Systems*—Septic tank systems do not have the ability to treat mini lab processing effluents properly. Discharging to such a system typically requires permits from state and local authorities. Kodak does not recommend this disposal method.

**Note:** If you have other questions about discharging FLEXICOLOR and EKTACOLOR Chemicals in the U.S., contact Kodak Environmental Services at (716) 477-3194. In Canada, call (800) 465-6325. In other regions, contact Kodak in your country.



## Chemical Choices and Treatment to Reduce Effluent

If you use this KODAK Chemical	At this Replenishment Rate	Make this Change	To Reduce this Component	Use this Replenishment Rate	Comments
FLEXICOLOR Bleach III Replenisher	35 mL/135-24 roll	Convert to FLEXICOLOR Bleach III NR Replenisher	Ammonia, iron, chelates	5 mL/135-24 roll	For Process C-41RA, use <b>only</b> FLEXICOLOR RA Bleach and Replenisher.
FLEXICOLOR Fixer and Replenisher or FLEXICOLOR RA Fixer and Replenisher	35 mL/135-24 roll	Desilver fixer effluent	Silver	35 mL/135-24 roll	For Process C-41RA, use <b>only</b> FLEXICOLOR RA Fixer and Replenisher.
EKTACOLOR PRIME SP Developer Replenisher	108 mL/m <sup>2</sup> (10 mL/ft <sup>2</sup> )	Convert to EKTACOLOR PRIME SP Developer Replenisher LORR	Sulfates, solids, developing agents, BOD, COD	80 mL/m <sup>2</sup> (7.5 mL/ft <sup>2</sup> )	For medium-to-high production volume. See page 9 for choices.
EKTACOLOR RA Developer Replenisher RT	215 mL/m <sup>2</sup> (20 mL/ft <sup>2</sup> )	Convert to EKTACOLOR PRIME SP Developer Replenisher	Sulfates, solids, developing agents, BOD, COD	108 mL/m <sup>2</sup> (10 mL/ft <sup>2</sup> )	For low production volume. See page 9 for choices.
EKTACOLOR PRIME Bleach-Fix Replenisher	108 mL/m <sup>2</sup> (10 mL/ft <sup>2</sup> )	Convert to EKTACOLOR PRIME Bleach-Fix and Replenisher LORR	Iron, ammonia, chelates	54 mL/m <sup>2</sup> (5 mL/ft <sup>2</sup> )	Use EKTACOLOR PRIME Bleach-Fix and Replenisher LORR if you use EKTACOLOR PRIME SP Developer LORR
EKTACOLOR RA Bleach-Fix Replenisher	215 mL/m <sup>2</sup> (20 mL/ft <sup>2</sup> )	Convert to EKTACOLOR PRIME Bleach-Fix Replenisher	Iron, ammonia, chelates	108 mL/m <sup>2</sup> (10 mL/ft <sup>2</sup> )	Use EKTACOLOR PRIME Bleach-Fix if you use EKTACOLOR PRIME SP Developer Replenisher.

If you use this KODAK Chemical	At this Replenishment Rate	Make this Change	To Reduce this Component	Use this Replenishment Rate	Comments
EKTACOLOR PRIME Stabilizer and Replenisher	248 mL/m <sup>2</sup> (23 mL/ft <sup>2</sup> )	Convert to EKTACOLOR PRIME Stabilizer and Replenisher	Water	195 mL/m <sup>2</sup> (18 mL/ft <sup>2</sup> )	Use EKTACOLOR PRIME Stabilizer and Replenisher LORR if you use EKTACOLOR PRIME Developer Replenisher LORR.

**Silver Recovery**—Silver is a seasoning product of processing photographic films and papers. Sewer codes may limit the concentration of silver in effluent that may be discharged. To reduce the amount of silver in the effluent, you can desilver used fixer, bleach-fix, and stabilizer solutions with electrolytic silver-recovery, silver-recovery cartridges, or silver precipitation methods.

To *increase* electrolytic silver-recovery efficiency, adjust the pH of your bleach-fix solution to 7.5 to 8.0 before desilvering it. For starting-point recommendations, use **one** of the chemicals listed in the table below to adjust the pH of the bleach-fix. Add the chemicals to the bleach-fix overflow slowly and with enough agitation to avoid precipitating iron. Your minilab may need more or less than the starting-point recommendation depending on its operation.

**Note:** Some of the chemicals listed are highly corrosive; handle them according to the instructions in the Material Safety Data Sheets. General precautions include wearing rubber gloves and a face shield. Potassium and sodium carbonate are the easiest and safest to handle. Sodium hydroxide is the least expensive. After adding the amount from the table, check the pH and readjust it, if necessary.

Chemical	To Adjust the pH to 7.5 to 8.0, Add to Each Litre of Bleach-Fix Overflow
28% Ammonium Hydroxide	10 mL
10 N Sodium Hydroxide	13 mL
45% Potassium Hydroxide	14 mL
10% Sodium Carbonate	100 mL
10% Potassium Carbonate	300 mL
EKTACOLOR RA Developer Overflow EKTACOLOR PRIME Developer Overflow	900 mL

Operate your electrolytic recovery cell according to the manufacturer's recommendations. Use as long an operation time as possible. Adjust the amperage to obtain a firm brown plate. Do not exceed 150 amperes for the largest cathode (14 inches high, 12-inch diameter).

### Solid Waste Disposal

In the U.S., Kodak established recycling programs designed to help labs minimize the amount of solid waste that they send to landfills. These programs include—

- KODAK Film Container Recycling Program
- KODAK One-Time-Use Camera Recycling Program

The terms and conditions of each program are different. For more information about these programs, contact your Kodak sales representative, or call the Kodak Information Center at (800) 242-2424 in the U.S.; or obtain recycling information online at [www.kodak.com/go/kes](http://www.kodak.com/go/kes). In Canada, call (800) 465-6325. In other regions, contact Kodak in your country.