The Frugal Photographer's Non-toxic Pinhole Camera Developer

Devised as a safe, inexpensive, yet highly useful developer suitable for science fair projects and pinhole camera experiments.

ISO 400 film should be exposed at about ISO 100, and slower films should be exposed at commensurately higher values.

Many substances can develop silver-halide films, including cola drinks, tea, coffee, red wine, human urine, and common kitchen and laundry materials. They are not in regular use for many reasons, some of which are fairly obvious, but primarily because they are time-consuming, inefficient, and generally yield high-fog, low-density, unpredictable results.

To develop films, these substances must be mixed into water that has been made alkaline. The alkalinity activates the otherwise inactive developer. The degree of alkalinity affects development speed and overall image contrast. Unfortunately, most simple "kitchen cupboard" developers require strong, caustic alkalis such as household lye or drain cleaner (both of which are dangerous for children to handle), and they require development times of about a half hour, sometimes much longer.

Here we present a deceptively simple formula that is actually surprisingly sophisticated. It combines two non-toxic developers, coffee and vitamin C, each of which is a weak and inefficient developer by itself, but which are "super-additive"—when combined, the mixture is substantially more active than the sum of its ingredients. It uses a relatively common laundry ingredient, washing soda, which is a mild alkali, as its activator.

Because it is non-toxic and does not use caustic alkalis, young children can safely experiment with it, as long as they are careful to not drink it, since it would undoubtedly make them sick.

Caution: this mixture has a revolting burnt-coffee smell. It stains film brown, but the stain should wash off easily.

You may be interested in the original magazine article that provoked these experiments: http://www.photoglass.com/PHG/PVT/SBug.htm . The article implies that salt water can be used as a fixer. In fact, fixing in anything other than thiosulfate is impractical, requiring far too much time, too much salt water, and yielding very poor results. Fortunately, sodium thiosulfate can be bought cheaply from pool supply companies, who sell it as a chlorine reducer.

We suggest always measuring with level teaspoons, for more batch-to-batch consistency.

This formula uses very rough, whole-number measures, because it is not possible to know in advance the potency and activity of ingredients sourced from a supermarket shelf.

This formula should give you excellent, printable images with just about any brand

of instant coffee crystals. It won't take a lot of experimentation to fine-tune the formula to accommodate your favorite brand of coffee, your film, and your working methods. Play with it for a while, and be prepared to be amazed.

Tap water at room temperature	1 quart (or 1 litre)
Washing soda (sodium carbonate) Arm and Hammer brand washing soda is available in many larger supermarkets. Sodium carbonate is also sold by pool supply companies as a pH modifier.	10 tsp (or approx. 50 to 60 grams)
Instant coffee crystals (buy the cheapest, and experiment). I find Maxwell House brand has relatively little odor.	4 tsp (or 4 to 5 grams)
Vitamin C crystals (ascorbic acid) Buy crystals from a health-food store. If crystals are not available, try crushing vitamin c tablets having the equivalent of 3 to 4 grams of ascorbic acid.	1 tsp (or 3 to 4 grams)

As you can see, precise measurements of ingredients is not an issue. There is an important lesson here — the variability of working methods usually has more influence on results than imprecision in measuring ingredients.

Add the ingredients to the water in the order shown, dissolving each completely before adding the next. The washing soda may be perfumed, and it will probably form a cloudy, somewhat gritty mixture that requires several minutes of stirring. Neither matters. If the chemicals react and produce fine bubbles, they should be allowed to dissipate before developing film.

This mixture retains its power to develop film for at least 24 hours, even when exposed to air. However, to be safe, you should probably only use it when it's relatively fresh. It would be worthwhile experimenting to discover exactly how it changes with age.

Processing:

Developing times vary according to the film you use, and you should experiment with times between about 12 and 18 minutes. I like 15 minutes as a starting point. Agitate 30 seconds initially, then 10 seconds each minute thereafter.

Stop bath: use a plain water rinse, at least thirty seconds, with agitation.

Fixer: Sodium thiosulfate crystals are available from pool supply companies, or from many old-fashioned camera stores. People with swimming pools use it to control excess chlorine. Dissolve 24 oz of thiosulfate in 4 cups of water. This is a non-hardening fixer and it may leave your film's emulsion prone to damage while wet, so be careful how you handle the film.

Fix thin films (such as Bluefire Police) for three minutes, and ordinary films for at least five minutes.

Wash for ten minutes or more in running water. To conserve water, wash in ten consecutive baths of plain water, agitating continuously for at least one minute per bath.

Shake off, or *very gently* blot away, any water droplets that adhere to the film, being very careful to not scratch the emulsion, and dry it hanging in a dust-free place where the air is still.