Browning / Adams Matrix film Formulation

The following matrix film was developed by me (Jim Browning) with the generous help of Rae Adams. This is a conventional Iodobromide emulsion, which has been adjusted for moderately high contrast, but without sacrificing tonal linearity. Making the emulsion requires a system for heating a two liter container (Stainless), and maintaining the temperature. A burette suspended over the container is used to slowly drip solution A into solution B over long periods of time. A propeller stirrer is also mounted over the reaction vessel, and run at slow speed. Washing the emulsion can be accomplished using the described method, or a more efficient coagulation method can be used. Either way, make sure you fully wash the emulsion to remove by-products of the crystal ripening. Use care when making the emulsion, completely scrub the containers and mixing vessels, and filter the emulsion before coating.

This emulsion works quite well, it has a fairly straight tonal curve, and exhibits a reasonable contrast. You may have to develop your seps to a slightly higher gamma. The film is somewhat slower than the old Kodak matrix film.

The following formulation (Trial # 15) is for one Liter of emulsion:

Solution A:

Potassium Bromide	42 g
Potassium Iodide	0.78 g (15.6 ml 5% solution)
Inert Gelatin	40 g
Distilled Water	500ml

Solution B:

Silver Nitrate	40 g
Distilled Water	500ml

Solution C:

Sodium Thiosulfate	8 mg (8 ml 0.1% solution)
Magnesium Bromide (1% solution)	9 ml
Distilled Water	10 ml
Gelatin	40 g

(gelatin added directly to the heated emulsion)

Solution D:

Potassium Iodide	2.4 g
Acid Yellow Dye # 23 (Tartrazene)	4 g
Saponin (5% solution)	1 ml
Distilled water	100 ml

1) Emulsification / Physical ripening:

Add B (at 55 deg C) to A (at 55 deg C). Use a burette over a heated beaker holding solution A at 55 deg C. Stir the solution slowly using a paddle mixer. (approx. 120 rpm). Temperature must be controlled to 1 deg. C using a temperature controller and hot plate.

Magenta:

Acid Red # 289	1.5 g
HL Reducer	100ml

Set pH to 5.00

Yellow:

Acid Yellow # 23	3.2 g
HL Reducer	10 ml

Set pH to 4.00

Mix the dyes with about 100 ml of distilled water and heat to near boiling. Add a few crystals of Thymol as a preservative. Add most of the remainder of water. Titrate the solution to the specified pH using Acetic acid and Trieth. Be careful not to let the solution become more acidic than pH 3.0 at any time. Top off with distilled water to make 1L of dye. Filter before use.

Developer:

Expose the film through the base
(Emulsion down), and develop in the following tanning developer:

Solution A:

Benzoatriazole	2.0 g
Oxalic Acid	8.0 g
metol	28.0 g
Pyrogallic Acid	30.0 g
Water to make:	4 L

Solution B:

800cc by volume of Sodium Carbonate to make 4L of liquid.

Mix 1 part A to 2 Parts B for normal contrast, develop for 3 minutes @ 68 deg F.. Make sure you presoak the film for 1 minute. Rinse film in cold water for 30 sec, and fix in a non-hardening fixer for 5 min. Wash off unhardened gelatin using four of five vigorous rinses at 120 deg. F. Dry.
Soak matrices in 120 deg. F water for 1 minute prior to soaking in dye for at least 5 minutes. Transfer the image for 5 minutes.

Condition the paper in paper conditioner for about 15 minutes before transferring the image. This is Bob Pace's formulation, I haven't tried it.

Trieth	60 ml
Glacial Acetic Acid	19.4 ml
Ethylene Glycol	100 ml
Water to make	4 L

Check pH and adjust to 6.0.

Some of the controls you can add to the first rinse are:

Acetic acid - increases contrast of print.

I am creating my separations digitally using a laser based film scanner / film recorder I designed and built a few years ago. I typically use 150mb files, which make 20x24" prints which are completely sharp, and show no digital artifacts. The recorder both scans the originals (Up to 150 l/mm) and records onto 8x10" film (EPN, VPS, TMX, Tech Pan). The film is held on registration pins, which allows exposing three seps in perfect register.

Alternately, seps can be made by exposing TMX (Tmax-100) film using red, green, and blue filters. The red and green principal color correction masks should be used when making the seps. Develop the seps to a higher gamma than the old Kodak film, Dmax should be about 1.50 Make a Hilight bump mask with about a 0.30 density which records only the hilights. Print each sep with it's associated hilight mask onto the matrix film. Develop in the tanning developer. The masking for this dye set will be different than the old Kodak dyes, but I haven't yet determined the correct masking for this dye set. I'll supply this information when I have it.

Some Phone Numbers:

Unique Photo 800-631-0300 (best prices on film - use TMX for seps)

VWR Scientific 800-932-5000 (General chemical supplier)

Photographer's Formulary 800-922-5255 (General Photographic chemical supplies)

Dupont 800-755-2930 (Jean Dunlap) Makers of Cronar film

Condit Mfg. 203-426-4110 (Warren Condit) Makers of pin registration equip.

Carolina Color and Chemical 704-333-5101 (supplier of dyes)

ICI 800-648-1926 (maker of Melenex polyester film stock)

Kind and Knox - 800-223-9244 (maker of Photographic gelatin)

First Reaction - Best price for Silver Nitrate
37 Depot Rd.
Hampton Falls, NH 03844
603-929-3583

Dr. Jay Paterson 713-768-4581 (head of Dye Transfer Co. Houston)
They reportably are making Matrix film and paper for sale.

You will need the Kind and Knox inert photographic gelatin. Talk to Mr John Dolphin, and he will send you a 1 lb sample. You must use an inert gelatin for this formulation.

If you need some advice about DT printing, or matrix film coating, please feel free to contact me:

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