The Chemistry: Chemicals and Sensitizer Formula

There are two principal chemicals employed in the traditional cyanotype formula, and these are mixed together in equal parts to create a working sensitizing solution that will be applied to paper with a brush. They are: Part A, *ferric ammonium citrate* and Part B, *potassium ferricyanide.* Neither of these chemicals poses a serious health risk unless you are one of the very few people who may have an allergic reaction to the chemistry. Ferric ammonium citrate is often found in iron and vitamin supplements and is mostly annoying if it becomes humidified and sticky. Potassium ferricyanide is a stable compound that only becomes a risk if it is heated beyond 300°F or if it is combined with an acid.

Part A—Ferric Ammonium Citrate (Green Type)

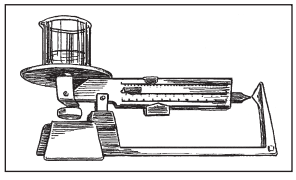
In the green powdered state, ferric ammonium citrate is a light-sensitive compound that changes from a ferric to ferrous state when subjected to ultraviolet (UV) light. Once mixed into solution it is subject to mold growth after a relatively short storage period. This moldy state is not detrimental to your cyanotype ambitions and can be avoided by adding a drop or two of Formalin (formaldehyde) to the solution. If mold does appear, it is easily strained off by decanting the solution through a coffee filter. In extreme cases the mold can be simply skimmed off the top of the solution with a pair of chopsticks. In any event, this mold growth is not something that should cause you to lose any sleep. In hot and humid weather, try not to let the chemical sit out in the open too long before mixing it into solution.

Part B—Potassium Ferricyanide

Potassium ferricyanide is the other half of the formula and is responsible for the blue color, when combined with the ferrous ammonium citrate. If the chemical is in good condition it should have a nice orange red, sometimes referred to as "ruby red," color. If it is in bad condition you'll see yellow lumps and you should avoid using it. Potassium ferricyanide is not particularly toxic because the cyanide group is bound to the iron atom and is not free to behave as a poison. The cyanide part of this chemical can, however, be released as a hydrogen cyanide gas if it is subjected to a strong acid, so be diligent about avoiding acid contact. Any disposal of potassium ferricyanide should be accomplished by diluting it with an excessive amount of water and disposed of in small amounts over a period of time. Do not throw it away in the trash in a dry state.

Making a Sensitizing Solution

You will need a nonmetallic mixing beaker and two dark glass or plastic 500 ml to 1,000 ml containers that will hold the mixed solutions. The easiest way to introduce yourself to the process is to purchase a premeasured dry or wet pack Cyanotype Kit from a supplier such as Photographer's Formulary or Bostick & Sullivan. If you are frugal and intend to do large pieces or a great many prints, keep in mind that kits from any source cost as much as would a virtual lifetime supply of cyanotype chemicals made from raw chemicals. After buying the chemicals in bulk, all you will need is a gram scale and some basic lab equipment. The following is a classic cyanotype sensitizer that, with the exception of Dr. Ware's New Cyanotype, is essentially identical to the vast majority of published cyanotype formulas.



The Cyanotype Sensitizing Formula

STOCK SOLUTION A

400 ml water (68°F)
100 g ferric ammonium citrate (green type)
Add water to make a total solution of 500 ml

STOCK SOLUTION B

400 ml water (68°F)
40 g potassium ferricyanide
Add water to make a total solution of 500 ml

Parts A and B can be separately mixed in normal ambient light and will work best after a ripening period of 24 hours. The Part A and B cyanotype solutions, if stored separately in dark glass or opaque plastic containers with a good seal, will keep indefinitely. When mixed together, their usable

life is a relatively brief 2 to 3 weeks. The sensitizer is so simple to prepare that there really isn't a good argument for having a combined A and B solution always available.

Standard Working Solution

Mix equal parts of Stock A and Stock B, that is, 25 ml of Stock A mixed with 25 ml of Stock B to make a 50 ml working sensitizer solution. A healthy sensitizer will be clear yellow-green chartreuse in color. This is also the color that your dried paper or fabric should be just prior to printing. If, after using good chemistry, you see blue or blue-gray at the dry stage it is likely that your paper or fabric has been fogged or the humidity has affected the sensitizer.

A Very Brief Word About Making Nonstandard Solutions

It is an acceptable idea to alter the chemical composition of the cyanotype formula in order to achieve variations in density, and a few beginning options are discussed below. I have found that greatly increasing the percentage proportions of both the potassium ferricyanide and ferric ammonium citrate to water will result in an increase in the density of the blue. This solution may solve the chronic fading problem that has plagued cyanotype on cotton murals in the last few years, because the quality of cotton has been compromised by additives in manufacturing. If, however, only ferric ammonium citrate is increased you will often experience a "bleeding" of the shadows, whereas an increase in potassium ferricyanide will result in a print with reduced density in those same values. This last observation is dependent on the type of paper you are using.

Low Contrast/High Contrast Solutions and Controls

Contrast control in cyanotype is, to me, often about controlling the visual associations of lighter to darker values in the negative translation and extending the range of cyanotype tonalities. It is common to experience a fairly significant loss of tonal gradations during the washing, toning, and drying stages, and the following suggestions are options you might take if your image is exhibiting problems of too high or low contrast.

A simple solution to reduce contrast is to dilute the standard working sensitizer solution with a small percentage of water. The greater the dilution, the softer the image. You may also create a lower contrast image by developing the image in a white vinegar concentration that is described later on in this chapter. Another method of controlling contrast is precoating your paper with a variety of weak acid solutions such as 1% oxalic acid or a 1% glacial acetic acid. In most cases, depending on the paper you are using, precoating, and drying, an acid bath will intensify darks and extend the visible tonal range. Be aware that regardless of the increase in density, this technique will often flatten the mid-range values and take the thrill out of the highlights. You can also achieve lower contrast appearance in your image by using the sun as your UV source. Cyanotype exposed by sunlight tends to provide a longer tonal range than does a mechanical UV light and thus creates a lower contrast image by a light to dark association.

A higher contrast solution can be mixed by adding 4 to 6 drops of a 1% solution of potassium dichromate to every 2 to 4 ml of the standard A + B sensitizer mix. This modest addition to the sensitizer will often let you print a poorly defined negative, but it may also degrade a portion of the middle tonal values. To make a 1% solution, mix 1 g of potassium dichromate with 100 ml of distilled water.

A similar contrast boost effect can be realized by adding a few drops of an ammonium dichromate solution to the initial water development bath. This percentage can range from 1% to 10%, and the exact amount that can be effective will depend on the strength of the percentage that you elect to use. Begin testing by making a batch of identical exposures through a Stouffer T2115, or equivalent, step-graded transparent scale. Process the first print in plain water as a control. Then make a specific dilute ammonium dichromate solution and add 10 to 15 drops of it to a liter of water and process a second test print. Write down the information, add either more ammonium dichromate or water, and make a third test. Proceed with the testing until you have established a set of working parameters that you can use effectively.

Contrast can also be managed in other ways. If you let a first coating of sensitizer dry thoroughly and then recoat it with a second application of sensitizer, you will notice a remarkable increase in the density of the darker values. By