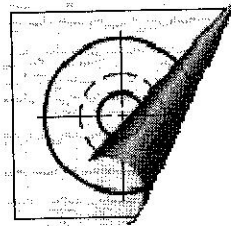


why are **BLUEPRINTS** *blue?*

In an era of *Computer Assisted Design* (CAD) it's hard to believe that any 19th century technique to do anything is still used, yet blueprinting is one. The word, in fact, has come to signify more than just reproducing copies of a drawing, it also describes any sort of master plan. How's that for perseverance?

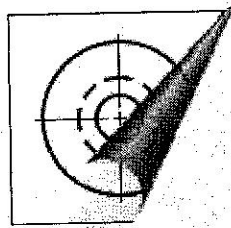
How Blueprints are Made

The process of blueprinting goes something like this: A designer or draftsman first makes an original drawing on tracing paper or tracing cloth.



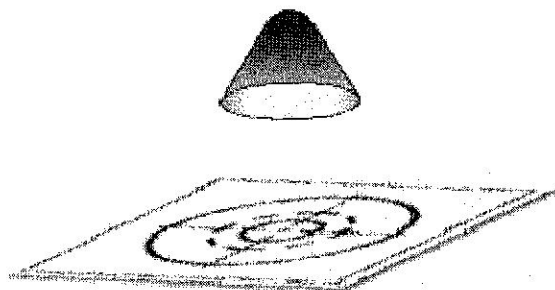
Original Tracing

This tracing is placed over chemically modified blueprinting paper. We'll get to the chemistry of the paper in a moment.



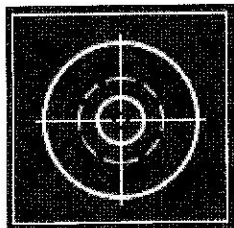
Layover

A bright light is shone on the paper for several minutes.



Hit it with Light

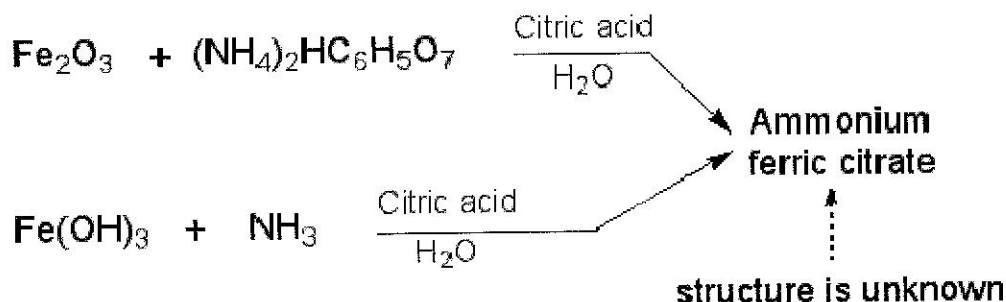
The bluprinting paper is then placed in a developing solution where, viola, the paper turns blue, *except where the original tracing blocked the light*. The bluprint is then washed and dried yielding a perfect negative of the original, give or take a few millimeters after washing and drying.



Finished Blueprint

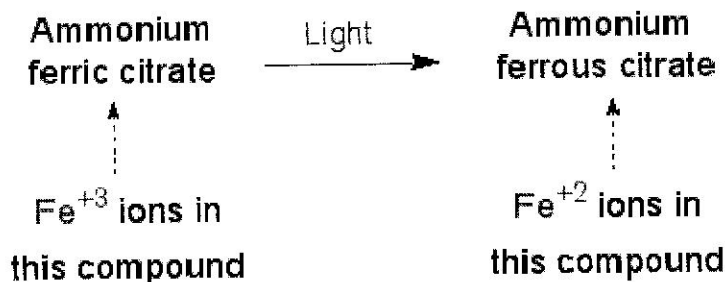
The Chemistry of Blueprinting

Blueprinting paper isn't just ordinary paper. It's coated with ammonium iron citrate. The formation of this compound is shown below. Amazingly enough, the structure of this inorganic compound isn't known, but we do know that iron is in the +3 oxidation state.



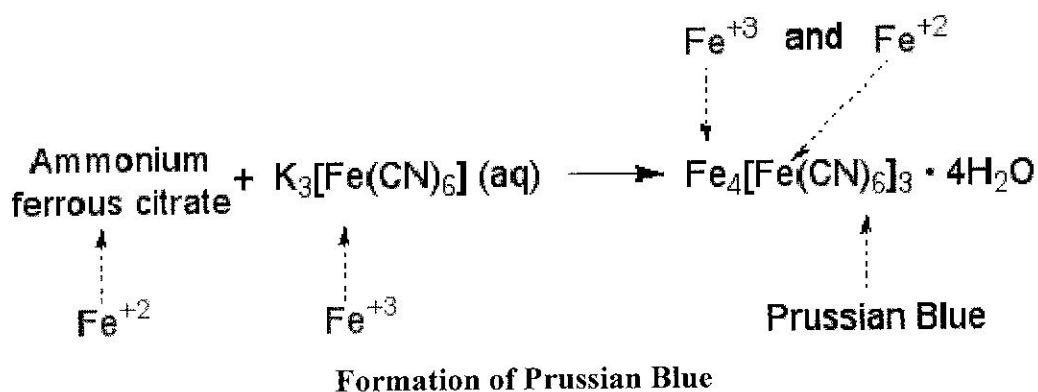
Formation of ammonium iron citrate

Next, the blueprinting paper, with the original drawing on top, is exposed to light. All the iron +3 ions, *except those directly under the tracing lines*, are reduced to iron +2.



Reduction of Iron +3 to Iron +2

The blueprinting paper, which is still white, is placed in an aqueous solution of potassium ferricyanide. This compound reacts with ammonium ferrous citrate and forms a compound called prussian blue. This compound, in it's hydrated form, is blue. The structure of prussian blue, also known as Turnbull's blue, is still under debate.

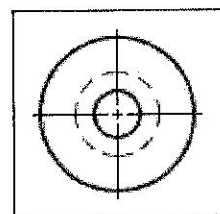


Now deserving of its name, the blueprint is washed. Prussian blue adheres to the paper while the unreduced iron +2 compound washes away.

Try this [experiment!](#)

Blue-line Prints

Blue-line prints get their names because they have a bluelines on a white background. It sounds almost too simple, doesn't it? These prints are made in the same way as a blueprint, but since they have inverted colors, an original with inverted colors is used. This inverted original is called a *brownprint*.



Newer Methods

The methods described above, though still used, are old and have given way to more sophisticated techniques.

Whereas blueprint reproductions are negatives of an original drawing, the diazo (whiteprinting) process provides positive images like those of blue-line prints, except the lines can be of almost any color on a white background.

The paper is coated with a diazo compound that is sensitive to ultraviolet light. Just as in blueprinting, the lines of the original protect areas beneath it. Whiteprints are developed in an ammonia atmosphere, but in this case, the *unexposed* areas, the lines in this case, change color.

Where're the polymers?

So you're scratching your head and wondering what all this has to do with polymers, huh? Well, to start, paper is made of polymers, and. . . Aw heck, you caught us. We weren't trying to pull a fast one, honest. The topic just seemed so darn interesting. And if you're reading this far, perhaps you thought so too.



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About.com Chemistry

How to Make Blueprint Paper

Easy Cyanotype or Blueprint Paper

By Anne Marie Helmenstine, Ph.D., About.com Guide

Blueprint paper¹ is a specially-coated paper that turns blue where it is exposed to light, while areas kept in the dark remain white. Blueprints were one of the first ways to make copies of plans or drawings. Here's how to make blueprint paper yourself.



A blueprint is a paper-based reproduction of a technical drawing in which the white drawing appears on a blue background. A photochemical reaction changes the color of the paper.

*Franklin M. Jones, U.S.
Department of State*

Blueprint Paper Materials

- 15 mL of 10% potassium hexacyanoferrate(III) (potassium ferricyanide)
- 15 mL of 10% iron(III) ammonium citrate solution
- petri dish
- white paper
- tongs or small paintbrush
- small opaque object (e.g., coin, leaf, key)

Make Blueprint Paper

1. In a very dim room or in the dark: pour the potassium ferricyanide and iron(III) ammonium citrate solutions together into a petri dish. Stir the solution to mix it.
2. Use tongs to drag a sheet of paper across the top of the mixture or else paint the solution onto the paper using a paintbrush.
3. Allow the sheet of blueprint paper to dry, coated side up, in the dark. To keep the paper from being exposed to light and to keep it flat as it dries, it may help to set the wet sheet of paper on a larger piece of cardboard and cover it with another piece of cardboard.
4. When you are ready to capture the image, uncover the top of the paper and overlay an ink drawing on clear plastic or tracing paper or else simply set an opaque object on the blueprint paper, such as a coin or key.
5. Now expose the blueprint paper to direct sunlight. Remember: for this to work the paper must have remained in the dark until this point! If it's windy you may need to weigh down the paper to keep the object in place.
6. Allow the paper to develop in the sunlight for about 20 minutes, then cover the paper and return to the darkened room.
7. Thoroughly rinse the blueprint paper under cold running water. It's fine to have the lights on. If you do not rinse away any unreacted chemicals, the paper will darken over time and ruin the image. However, if all the excess chemicals are rinsed away, you'll be left with a permanent colorfast image of your object or design.
8. Allow the paper to dry.

Cleanup and Safety

The materials for making blueprint (cyanotype) paper are safe to work with, but it's a good idea to wear gloves, since you'll be working in the dark and might otherwise cyanotype your hands (turn them temporarily blue). Also, don't drink the chemicals. They are not particularly toxic, but they are not food. Wash your hands when you are done with this project.

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