PRACTICAL METHODS FOR SUN AND ARTIFICIAL LIGHT BLEACHING PAPER

by Cathleen Baker

The use of light to bleach paper while in a buffered aqueous solution promises to be the safest and easiest method to reduce staining and discoloration in paper artifacts.

For obvious reasons, certain locations in the USA (and abroad) will have more available sunlight during the year than others. Sun bleaching can be done on partly cloudy days, hazy days, and can be fairly effective from as early in the morning at 10:00 to as late in the day as 5:00 depending on the time of year, location of lab., etc. As long as the light hits the paper surface, bleaching will take place.

The basic procedure for sun bleaching is to find a tray large enough for the paper artifact to lie flat on the bottom when it is wet, and to allow easy access to the paper edges. Using a flat surface outdoors such as a bench, table or makeshift table of sawhorses and boards, position the tray to eliminate any shadows from trees, buildings, and the tray itself. Fill the tray with enough solution to cover the paper at least 1". The more solution you use, the better the washing and bleaching effect of this procedure. The buffered solutions can be either:

1:5 magnesium bicarbonate to deionized or distilled water or
.4% solution of saturated calcium hydroxide in deionized or distilled water.

I have found that the best way to carry the pre-wetted paper out to the tray is to use a Mylar package. Cut two pieces of Mylar, 5 mil or heavier, to fit the bottom of the tray. In addition cut a piece of non-woven material such as Hollytex (heavy weight), Reemay or Pellon the same size as the Mylar. The package will be in layers of, from the bottom, Mylar, Pellon, paper artifact and Mylar on top. This package is easy to carry wet or dry. For badly torn or large artifacts, an additional rigid support such as a screen might be necessary. It is important to keep the top piece of Mylar over the immersed artifact to act as a UV filter, and to protect the paper surface from particulates from the air and bugs. Glass weights may be necessary to hold the package under the solution.

Exposures to sunlight vary from stain to stain, paper to paper, the time fo year and the day of exposure. The average exposure per side is about 3-4 hours. By checking periodically, you can moniter the progress of the procedure and once the desired bleaching is reached, the solution can be either syphoned off or poured out. The tray with the package in the bottom can then be carried safely indoors. After each exposure, the paper artifact should be washed for about 5-10 minutes in deionized water with a buffer added. This step is to wash away any residual degradation product from the bleaching procedure. The piece can then be air dried. If the piece requires more bleaching, the steps can be repeated. If at any time during the bleaching procedure, the buffered solution becomes very brown, it should be siphoned off and fresh buffered solution carefully poured in the tray.

Sadly we all do not live in places of abundant sunshine or in places where accessibility to the outdoors is possible or where air pollution from particulates presents a real problem. Therefore artificial light bleaching can provide a real alternative to sun bleaching. Many sources of light have been used for this purpose. Sun lamps bring relatively quick results but there is a problem of severe heat build-up. Fluores-

cent lamps would seem a good choice as they do not cause severe heat build-up and are cheap to use, but require longer exposures and therefore longer immersion times.

Of these, I have most commonly used a light bank of 8 G.E. 100 watt F84PG17-CW Power Groove Cool White fluorescent lamps. The Power Groove tube has a dimpled surface and hence emits more light than other tubes of the same wattage. Slight heat build-up, to 100°F, can be counteracted by either using a fan or by increasing the distance between the paper surface and the bulbs. A free standing apparatus using 8 tubes and 4 ballasts can be easily constructed from materials from hardware and lighting stores (please write for plans). This apparatus stands on the table top with the tubes 6"-12" above the surface, the height being adjustable. Trays can be easily moved in and out. Preparation for artificial light bleaching is the same as for sun bleaching. Shadows however will not occur, and bleaching by this method does not have to be so closely watched. Exposure times will increase as the average output in foot candles for the 8 Power Groove tubes is about 3700 while sunlight averages about 8000. In theory, to accomplish the same amount of bleaching, paper would have to be exposed to this artificial light bank about 2.2 times as much as sunlight. In practice, artificial light banks require slightly longer exposures as the wavelengths are not comparable.

Paper artifacts can be "float" bleached. Light sensitive areas, colors or inks can be masked out, and in cases when the paper is thin, bleaching from the reverse only,will help to reduce staining that extends through to the front.

It is recommended that whenever possible some type of UV radiation absorber such as Mylar, UF1 or UF3 be used to minimize the potential damage of that light on the cellulose chain. Caution must be used however when employing a filter. Make sure that all filters are kept below the surface of the buffered solution. To lay the filter over the top of the tray will cause a greenhouse effect and can heat the solution to temperatures over 160°F. UV filter sleeves could be used over ordinary fluorescent bulbs if you use those. They will not fit over the Power Groove tubes.

Sun and artificial light bleaching has great potential and hopefully more research will be done soon to find the optimum bleaching conditions which will bring about the greatest bleaching capabilities while reducing the danger inherent in this and all other bleaching methods.

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