



Think Ink

BY RAY WORK, Ph.D.

To Brighten or Not to Brighten

Scientifically examining the controversy over OBA inkjet media additives.



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28 years in research, research management, business development and business management with DuPont. Dr. Work holds a Ph.D. in physical inorganic chemistry from the University of New Orleans. He can be reached via e-mail at workassociates@comcast.net or visit his Web site www.workassoc.com.

WITHIN THE FINE ART and professional photographic communities, there has been increasing interest and discussion concerning the pros and cons of the use of brighteners—better described as optical brightening agents or OBAs—in inkjet media for fine art reproductions and long-lasting photo prints. Many statements have been made that suggest these additives will cause the prints to have a short life before fading or yellowing. Some have been told that only “OBA-free” media are truly archival. Here I intend to offer some scientific information and third-party laboratory data that will shed some light on this subject and put to rest the fear that OBAs are evil and must be avoided.

WHAT IS AN OBA?

OBAs are organic dyestuffs that absorb ultraviolet light and reemit or reflect that light in the blue part of the visible spectrum. They have been used for many years at low levels to whiten and brighten paper and canvas. If they are controversial, then why use them, you might ask. The short answer is that if you want a white substrate on which to print, then they must be used. The ingredients in canvas and papers, and

their inkjet coatings are not white but rather cream or tan in color. This color is frequently referred to as “natural.” Only with the addition of OBAs is a truly white or bright white media possible.

With exposure to light and heat, over time the OBAs can lose their ability to fluoresce and add the blue light to the reflectance spectrum. The result is that the media will revert to the original color of the materials that make up the media and its coatings. It is unlikely that these OBAs will turn yellow. When they decompose, they become colorless. Choice of the type of OBA and the amount used along with its location in the final print affect the rate at which this occurs. In our modern inkjet fine art papers and canvases, the OBAs chosen along with high-quality paper, canvas substrates and

coating materials result in excellent print longevity with little risk of yellowing, due to the OBAs fading over the life of the print. In addition, they do not interact with the pigments in the inkjet inks provided by the printer manufacturers.

WHY BRIGHT WHITE?

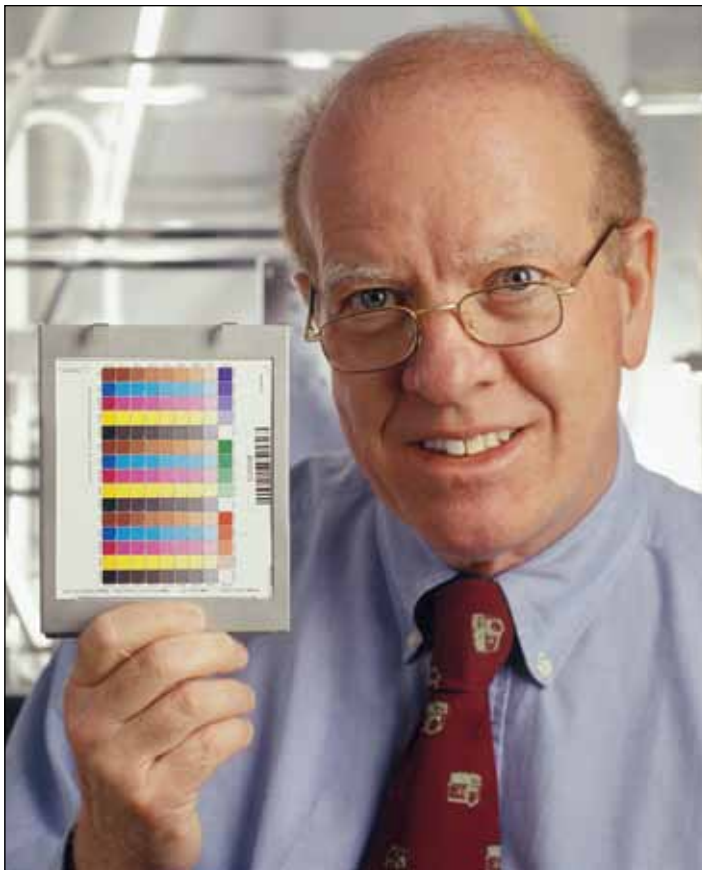
Inkjet inks contain transparent-colored dyestuffs in the form of pigment particles. They are small and do not scatter light. They are used to provide “subtractive color.” Their ability to provide a wide color gamut and high color saturation are dependent on the color and reflectivity of the substrate onto which they are printed. The pigments must remain above the reflective layer, and the layer must be as white and bright as possible, or the resulting print will be limited in

CONTINUED



Concerned industry members should recall that legendary American scenic photographer Ansel Adams used fiber papers containing OBAs in the 1970s for his photographic prints.

Henry Wilhelm, president of Wilhelm Imaging Research Institute, holds a test target print. Wilhelm has recently completed new evaluations of the display life of a range of art papers and canvases—both with and without optical brighteners.



color gamut and suffer from low color saturation. The colors will look “dirty” by comparison because the color of the substrate is added to the colors of the pigments to give the final visual color.

WHERE OBAS ARE USED

Let’s start with fine art papers. They must contain some OBAs in order to provide a white substrate. Those that are truly “OBA free” offer a cream or “natural” color, not a truly white surface. If the whiteness or brightness of a paper or canvas is greater than 90 percent, there most likely is an OBA present. In paper, OBAs may be in the paper itself, in the coating on the paper or both.

Hahnemühle, a leading manufacturer of digital fine art papers, has been producing fine papers for 425 years. They make a statement on their Web site (www.hahnemuehle.com) regarding OBAs:

“Hahnemühle FineArt would like to comment on our use of optical brighteners. As a basic principle the papers included in the Hahnemühle Digital FineArt Collection have been rated to last for hundreds of years according to the ISO Standard 9706 for

archivability. The rag and alpha cellulose used contain the lowest possible amount of lignin, so that the whiteness of the base papers will barely alter after hundreds of years. At the request of many customers Hahnemühle offers bright white papers, where optical brighteners are needed in production. The whiteness of the base materials may alter slightly over a period of between 20 to 200 years. Some users regard this as a “natural patina” of fine art prints, while others find this not to their liking.”

The company offers its customers three categories of white papers:

- Natural white papers without optical brighteners
- White papers with a minimum of brightener (< 0.1 percent)
- Bright white papers with 0.1 to 0.8 percent optical brightener

Hahnemühle indicates that they use the highest quality optical brighteners, which are added directly to the pulp mixture during production. Over the course of time, these optical brighteners will lose their ability to reflect UV light. Depending upon the print’s exposure to

light (affected by whether the image is unprotected, exhibited behind glass or protected with a compatible protective spray), the effect of optical brighteners may decrease at a quicker or slower rate.

Category one, *no optical brightener*, and category two, *a minimum of optical brightener*, have been third-party tested by Wilhelm Imaging Research Institute Inc. in combination with the Vivera inks from Hewlett-Packard. (The report is posted on the Hahnemühle Web site.) Wilhelm found that over a simulated test period of 200 years no appreciable change in the whiteness of the paper was detected. Even in the case of the papers belonging to category three, the bright white papers, after testing by the German FOGRA institute remained stable for a test period of between 20 and 50 years (see the certificate on the Hahnemühle Web site).

They indicate that bright white papers with a whiteness of between 100 percent and 110 percent have been requested by many of their customers. They indicate that it is not possible to produce these papers without optical brighteners because the main components of the paper, alpha cellulose, only has a natural whiteness of 95 percent (maximum) and cotton linters only 90 percent.

To achieve the maximum color saturation and color gamut from the inks, a bright white media is required.

OBAS AND CANVAS

Canvas is produced using glued fabric of cotton or cotton/polyester blends, coated with a white coating called “gesso,” then coated with an inkjet coating, which may be matte or satin in finish. Canvas manufacturers face the same issues of whiteness as paper manufacturers. To get a white product, some level of OBA is required. Here the OBA can be added to the gesso and/or the matte or satin inkjet-coating layer. Some have claimed that they can produce white canvas without OBAs, but that has not been possible as indicated by Hahnemühle in the discussion on paper. Canvas is naturally beige in color, and if no OBA is added to the gesso

coating, it remains “natural.” Some OBAs must be included to reach 95 percent or higher whiteness and maximum color saturation and color gamut.

EFFECTS OF COATING

Coatings should be designed to be compatible with the ink and media on which they are used. Incompatible coatings may crack or yellow over time. The coatings should be chosen based on the recommendations of the provider of the media and not “mixed and matched” without regard to compatibility. I have seen ugly examples of splotchy canvas prints coated with an inferior or incompatible coating. Coatings generally contain UV inhibitors, which absorb UV light and prevent the OBAs from being activated as they aid in the protection of the color pigments from fading. The protection is a combination of the thickness of the coating and the formulation. If the coating is applied in a non-uniform manner, it may lead to a splotchy fading or yellowing. In general, coating can add tens of years to the life of a print.

INKS AND MEDIA

We are fortunate that Wilhelm Imaging Research (www.wilhelm-research.com) recently has completed new evaluations of the display life of a range of art papers and canvases from three major providers of water-based, wide-format inkjet printers with OEM pigmented inks. You can see the details at the Wilhelm Web site.

The results are too extensive to list here, but, in reviewing them, I can draw some important conclusions from Wilhelm’s data.

- Each OEM provides lightfast pigment-based inks.
- HP’s inks provide the longest display life, followed by Canon and then Epson.
- All of the media tested with the OEM inks show good display life, especially when displayed under glass.
- For Canon, the paper tested with the best performance was the only one tested, which included OBAs.

- There is no trend in this data that suggests the presence of OBAs reduces longevity.
- The use of coatings increases the display life in the canvas and ink systems tested but only slightly.

BEWARE OF SMOKE AND MIRRORS

I have become concerned in reading literature describing novel “non-OBA” whitening technologies that make products whiter and brighter. What concerns me are the claims that these technologies offer better longevity and are somehow better than conventional OBA dyes. I have seen no evidence that such a product exists in inkjet paper or canvas. If the product absorbs UV light and reemits visible light, then it is defined as an OBA. If it glows in a dark room while under UV light illumination, then it contains OBAs.

The OBA may be in the paper under

a coating layer, which is free of OBAs, or a canvas where the gesso layer under the inkjet coating contains the OBAs. In these cases, the claim that the product is “OBA free” is not credible. “OBA free” claims of better longevity have not been supported, to my knowledge, in independent laboratory data. Because the “OBA free” papers and canvases in the Wilhelm test results do not appear to offer any significant advantage in longevity, it appears that those claims are simply marketing efforts to promote one product over another but without any verifiable proof of superior performance.

My advice is to beware of smoke and mirrors, and be sure to check out the claims to make sure they are based in science and are not just marketing hype. Remember, even Ansel Adams used OBA-containing fiber papers in the 1970s for his photographic prints. **SDG**

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