

SUNY/ RadTech Webinar 2015

UV Through the Years: A Studio Artist's Perspective

INTRODUCTION

Thank you Sean and thank you all for joining me today to discuss my use of UV adhesives and UV technology over the years as a studio glass artist.

I would like to start by introducing you to me and my glass art. I will present an overview of how I became interested in UV adhesive

and technology and how they have become major components of my work since the 70's.

I will also discuss how, as a studio artist I had particular difficulty trying to use the products on a small scale using non traditional and non commercial applications.

Along with a brief history of my art, I will also discuss how my introduction to UV technologies began to inform and shape my work both in design and functions. And how it continues to influence my current designs.

From there I will discuss recent advancements in UV technology and how it lead me to the use of pigments in new designs, thus changing my UV formulas and need for additives and creative formulations.

Finally I will discuss the direction I see my work heading and how UV could help me get there.

(HISTORY) (breath!)

I have been creating plate glass sculptures for over 40 years.

I was born and raised in Normal IL.

In the 70's I was trained as an artist and glassblower at Illinois State University.

This background, as well as interests in design and architecture

formed a foundation of skills and eventually led me to plate glass construction which I continue to work with today.

My art is created using cut and polished glass that is laminated using pigmented ultraviolet adhesive.

My designs have changed and evolved over the past 40 years based on artistic choices, formal aesthetics, interests in architecture, color and light.

Throughout this evolution, UV technology and adhesives have played a major role.

Without them, and constant research and help from industry leaders, I would not have been able to create my art.

When I began working with plate glass there were only a handful of artists doing similar work. The contemporary glass art movement was at its beginning stages so the research was minimal.

In 2012 we celebrated the 50th anniversary of the contemporary glass movement.

I did then, and continue now to work on a trial and error basis. I am my own conceptualizer, designer, researcher and development staff. As my art progressed over the years so too did my need for advanced technologies that would help me make my work.

You could say that my studio glass art and UV technology share a symbiotic relationship. When I have new ideas, the need for new technology arises, and when I discover new technology, I design new pieces and the cycle continues.

Adjusting to the new technology and finding solutions to issues that arose from my new designs over the years proved particularly challenging because I am a studio artist. It is and has been difficult to develop commercial techniques into a small scale studio practice or to purchase small quantities of products or get technical support.

So that is the overview of my work, and now I will take you back to the beginning and describe the products I used, the problems that arose and the solutions I discovered that have helped me create my art.

(Glue)

(lamp, or #17) My earlier work during my undergraduate studies were created out of blown glass that I glued into sculptures using epoxy. Epoxy worked well for basic construction.

I eventually switched to using Loctite 312 which is an anaerobic adhesive used to glue rear view mirrors to car windshields.

Using this material was a quick way to put pieces together

and clean them quickly.

In 1977 I moved to Boston where I attended graduate school at Mass College of Art. Bringing few materials with me, I began my art career laminating plate glass into sculptural forms

OWN STUDIO

As a Masters of Fine Arts candidate in grad school, I was concerned purely with making art. I created large scale sculptures using aluminum and hardware with glass I salvaged from the broken windows of the John Hancock Tower in Boston.

But during my final spring semester at school I realized I had to make a living and my goal was to become a professional artist, By the way, professional artists make up 1/2 of 1% of all who profess to be artists.

I realized that the large scale of my studio glass artwork was problematic for transporting and displaying in small galleries, and not yet popular in the newly developing contemporary glass art market.

So I came up with the Plate Glass Vase.

They are all my interpretations of historic blown glass vessel shapes with fused with my interest in laminating plate glass technology.

(NEW STUDIO)

After graduate school I established my own studio

and began my professional career with Sidney Hutter Glass & Light, Inc.

For the next 12 years, (79-91) I worked in this studio and continued to make the Plate Glass Vases using Loctite 312.

Because I only had clear, anaerobic adhesive available to me, I was also looking to add color into my work in some other way.

The only color available to me were from the glass. And green, bronze, ford blue and gray plate glass were it.

I also had acquired a small supply of Vitrolite which is a historic or antique opaque glass which was used primarily for architecture in the 1930's. I had mostly blue, black and white. I will get more into advanced color technology later as it has become a major component in my work.

I was now making work on a smaller scale
and incorporated more color and texture with
wood, metal and rubber with the glass.

In 1982-83 I was introduced to my first UV curing adhesive, Loctite 349. This product brought about huge advancements in my work.

Being an artist interested in technology led me to these new UV adhesives.

Unlike the Loctite 312, the new UV Loctite 349 allowed me to **spot cure, laminate each piece of a vase in fairly quick succession leading to pieces finished more quickly.**

This was an exciting time as this new technology was introduced to the commercial glass industry. But I was realizing that it was hard for artists like myself to gain information about the products.

I was wanting to use the materials on a small scale in specialized ways which hadn't been tested by the commercial industry.

(Quasi)Although each piece I created had a set of similar glue joints, there was no specific uniformity to each of my pieces. They could vary in glass color, size, shape and functions.

This is much different than a large company wanting to make thousands of glue joints the exact same way using the exact same application as in commercial glass goblet or cake plate production where they glue the stem to the piece.

So I needed to learn and understand the technology the best I could before I applied it to my artwork.

There was little to go by but trial and error at me expense. This theme has recurred throughout my 40 years of art making.

So here are a few challenges with the UV adhesive at this point. One, I was unable to cure through opaque glass unless it was laminated only on one side to a clear piece. Then I would have to keep flipping the piece to allow the light to penetrate through the edge of the clear glass. Not practical.

And second, I found out the hard way that UV glue is dermatological irritant. There was no MSDS available to me and I developed contact dermatitis.

I created this piece, the Quasi Modern, as the symbol of the Death of the Vase. My dermatitis was so painful and I was unable to work as I was used to.

I continued my research and found barrier creams and nitrile gloves that provided me with the safety I needed.

I also created new designs using mechanical connections rather than laminated glass.
(Pause.....)

Around the same time I found the new UV adhesive, I had to find UV lights. My first light source was a fluorescent Circline black light bulb with a very low nanometer output. Using it with a swing light that had a clear magnifier in the center helped me be able to see through to the lamination joint.

At this point I was facing new problems with my work:

- improper light intensity**
- too slow cure time**
- Inability to cure multiple layers.**
- glue chipping during cleaning.**

The solution to each of these problems was the need for a **stronger light and more knowledge of the UV industry**. So I called and asked a lot of questions. I was beginning to develop a new skill in How to work with companies to help me understand and user their products properly.

In the late 80's early 90's I was finally able to find and afford a **two light system** that brought big advantages to my studio practice.

I started working with a Spectralite UVP 100, a Loctite Zeta 7400 and eventually the Dymax EC2000 which I continue to use today. With these, I developed a two stage lighting system of fixture curing and full curing.

The two stage system allowed me to:

-**increase light intensity** solving my full curing problems.

-**decrease cure time** which economized production

-And allowed me to **cure multiple layers at one time** which helped with speed and accuracy

The two stage system let me spot cure which meant I could laminate large surface areas together without a huge light.

After pre-cure, I could then transport the piece to the bigger light we refer to as the 'cooker' to obtain a full cure. But also due to the new intensity of my lights, I was experiencing chipping with some pieces.

One design, the Solid Vase Form, is a vase constructed of 72 pieces of 1/4" glass.

The edges remain fairly rough, with a slightly beveled edge. When the glue that squishes out between the glass layers becomes fully cured it is hard to remove with an X-acto knife. The cured glue chips the glass as its removed.

The two stage curing system solved this issue as well. After a spot cure, the glue is cleaned up before final cure. This new information of UV and Light Technology opened a whole new way of working for me. It helped inspire me to create new designs.

I designed this series of new Solid Vase Forms that would use fully cured sections that I would then cut and polish before re-incorporating into the piece.

(choose PLPGV and PLVV) This also made the Polished Laminated Plate Glass Vase and

The Polished Laminated Vertical Vase series possible where sections were laminated then ground and polished on the edges.

(car3#50) And the Twisted Solid Vase Forms which are.

As usual there were issues faced with the new technology and my new designs.

I was now facing issues with:

- Viscosity**
- Adhesive Shrinkage**
- Cracking due to temperature issues**
- And sawing issues**

The **viscosity** of the glue came into play because I was glueing a variety of circle sizes. As a rule, we found smaller joints could use thicker adhesives and larger surface areas require thinner. Some of my designs required a bit of each. The viscosity of the Loctite 349 wasn't working for all joints so I experimented with several thicknesses of adhesives.

(stress cracks slide) I was also getting adhesive **shrinkage** because I was finally achieving a full cure. Before, I was not curing properly and the adhesive did not shrink,

but also did not fully cure properly. Once cured in the right manner, some of my designs were cracking. New problems arose with the Solid Vase Form.

(detail SVF edges) In this design the edges for the glass are left basically raw cut with slightly beveled edges. The glue that was left on the edges during the full cure was shrinking and causing cracking completely around the perimeter.

After repeated attempts trying to resolve the issue I was unable to find a solution through Loctite. I looked for a new source and discovered a line of UV adhesives from Dymax Corporation. Through more experimentation they demonstrated a lower shrinkage ratio. I was then beginning to learn about individual adhesive formulations. Through a developed relationship made with Dymax, I was able to have specific adhesive formulations made for my specific studio applications.

All was well for a while. I had developed my work to work with the UV and the UV to work with my art.

There were other interesting findings throughout this time. One of which was discovered during the colder New England months when the ambient temperature dropped. The cold changes the rate of contraction and expansion between the glass and the adhesive. This is especially evident in the pre-laminated sections that needed to be cut or ground. The solution here was to preheat the pieces in a warm box prior to any abrasive cold working.

Here are a few shots of the equipment I have used and have had made for me over the years to cut, grind and polish complicated pieces.

(Saw)

(Recip, grider, polisher)

COLOR

Concurrent with research and development in UV industries, The glass industry went through changes and new clear glass was being manufactured.

In the early 1990's I discovered optically clear glass by AFG, trademarked as Krystal Klear. This new technology meant I could make clearly clear pieces. This proved a major turning point in my work.

(studio) I also moved my studio to newton in the early 90's.

And around the same time, I was made aware of adding colors to UV adhesive with the use of dyes. Up until now the only color added was from the color of the glass available to me. With dyes and the new Krystal Klear glass I now had control of the color. This started yet another avenue of research.

I started using Pylam and Morton dyes which were used in the fabric industry. They proved not to be strong enough and faded too quickly. I was then introduced to the Orasol line of dyes manufactured by Ceiba Geigy, now BASF. They were used in the conservation and art restoration fields.

I had looked in to using Pigments at that time but found them to be insoluble in the preferred adhesives that I used and difficult to cure. I have begun using them recently but I will address that later.

The dyes allowed me to create an unlimited variety of colors. My pieces became pools of color and more like three-dimensional paintings as the color and light bounced within each piece.

Each piece changed as you walked around it because the colors would mix internally and emit color through the edges.

(color comparison)I was also introduced to the BASF line of Lumogen fluorescent dyes. The addition of these dyes increased my color palette significantly.

With non-fluorescent dyes, the color in the adhesive remains transparent giving an overall light-transparent quality to a piece.

When fluorescent dyes are added to each color, it creates a vibrancy to the colors and a slight opacity. This opacity causes the color to become a stronger element in the piece.

The choice of color combinations were also widened because the ratio of fluorescent dye added to regular colored dye can be adjusted.

I began adding a clear-violet fluorescent dye to clear adhesive. Although not totally visible to the naked eye under certain light, the fluorescent dye casts a hint of violet. This effect adds depth to the artwork, which regular clear adhesive would not give. By now you will begin to see the the pattern forming. With this new technology more issues arose that took some time to resolve.

The new issues were:

- inconsistent curing between colors**
- the concentration of dye in each adhesive mixture inhibited the cure**
- and the light fastness of the dye colors themselves**

First, the inconsistency in curing between the colors was problematic. I was having trouble with certain colors **curing more quickly** than others. When working with several colors on one circle we were seeing cracking at the intersection of two colors.

I also did extensive experimentation with how large a **concentration of dye** to add to the adhesive. Too much dye caused longer cure times, too little dye had poor color saturation and impact.

And most important, I found the **light fastness** of the dye was inconsistent and weak - not light fast enough and caused bleaching!

(curing times slide)I found that the blue, which are blues, greens and purples, fade more than those colors with red or yellow in them. As color was now a major factor in my work the light fastness was becoming a issue.

Though collectors of my work were advised not to put their pieces in direct sunlight, it was up to them and too often the advise ignored. They assumed it was like melted glass whose color never fades. Years later those that did not heed my advise found fading in the top of the sculptures.

(Our Technology)To solve these problems, of course there was more research to be done. The results were learning how to use UV additives like UV Stabilizers and Photo Initiators.

Through my work with Dr. Stephen Cantor at Dymax, I was able to have formulations made for me using both a UV Stabilizer and different photo initiators. He helped me gain a greater technical understanding, both chemically and physically, of the processes involved in using the materials. Several trials using different levels of UV stabilizers revealed that approximately 1 percent UV stabilizer is enough to partially control the fading of colors while curing without complications, such as cracks.

(*no uv/uv)The following examples show the difference between the adhesive containing the stabilize rand without.

(UV Sta)Using a stabilizer is an oxymoron. How do you cure a UV material while trying to block out the UV light?

Well, two ways. Increase the cure time and add Photo Initiators to develop a balance between stabilizing the colors and keeping them from fading.

The longer cure time can, however, cause more opportunity for errors during the curing process. Slight movement of the glass during the cure can cause cracks, as seen [HERE](#).

(bubbles)Uneven pressure on the two sheets of plate glass cause separation during the curing process as air is sucked into the adhesive. This may result in small bubbles forming at the edges as well.

My rudimentary knowledge of Photo Initiators led to more research.

(PI)Learning how to use the photo initiators to polymerize the adhesive was an extremely important education. We made a packet of two Photo Initiators from BASF. BASF 819 and 1173. Each of which has different effects on the cure.

At this point I began augmenting and creating my own adhesive mixtures in the studio.

The Photo Initiators did two things, they enhanced the depth and strength of cure they also allowed the use of light in the visible range to help cure and enabled me to add visible light as a tool to cure the material. Light above 365 NM up to the 400's could now

be used. By lowering the light energy needed to cure, it made it possible for me to go back and re-investigate pigments which have a high light fastness.

(Pigment image) This brings us up to around 2013. Here is when I began to see significant increases in the use of pigments in the commercial coatings industry that were comparable with methacrylates.

(pieces) Over the years I had developed a relationship with a retired chemist from Cabot Corporation named John Ross. He helped by botching to the studio to see my concerns and by giving me pigment samples that had been properly dispersed in the materials compatible with methacrylate adhesive.

With the new pigments and the addition of Photo Initiators, I was able to cure pigments in a similar fashion to dyes.

These are some examples of pieces using pigments. The color is more rich, and also more opaque.

This led me to research in the pigment industry which led to research and a trip to the American Coatings Show. Here I was exposed to a myriad of manufacturers of pigments and special effect pigments.

I obtained samples which to me is a lifetime supply. That's one upside to the small studio scale. The downside is that if I want to order a small quantity it gets tricky. Companies want to sell you a train car of pigment where I only need a few grams at a time.

We had some settling issues with the pigments and have experimented with suspension agents to keep the adhesives well mixed and dispersed with materials from BYK.

Presently I am using Special Effect pigments to enhance the refractive quality of each piece. This led to a new series titled Shifting Transmission.

These new special-effect pigments are mixed into other colored pigments to create pieces that react with light and shimmer dramatically at different angles.

At times the glass is transparent, at times opaque.

And still at other times the light bounces off the micron sized particles creating sparkles throughout the piece.

All the research into commercial application of UV adhesive and technology, along with advancements in glass formulas and products and my new interests in the coatings world has helped my designs and my art grow over the years.

Still now I continue to design new pieces based on technological advancements. I have also realized that my art has been part of a relatively small contemporary glass art scene. I am now looking to expand my market with a new line of Home Decor items.

(Csd)I have recently produced a line of Candle Holders

and menorahs

and have a new pendant prototype in the works

as well as some new wall sconce designs.

(sid with respirator)Thank you all for listening in today. I hope you can see how I have fostered a relationship between my art interests and technology.

(question slide)If you have any questions I would be glad to answer them.