

Chairman's Message



Greetings Color & Appearance members and friends,

We are living in unprecedented times! Many of us are WFH (working from home) with our spouses, children and pets and that presents a range of challenges that most of us have never dealt with in our professional careers. Most of us were working diligently to arrange our meetings at ANTEC® in San Antonio that has been subsequently redesigned as a virtual meeting. The good news for SPE is that many people will join the meeting virtually and the show will go on!

We had a leadership meeting with SPE HQ last week and someone raised the question about these virtual meetings and will it be possible “to go back” to a face to face meeting in the future. I remember our RETEC® meeting a few weeks after September 11, 2001 where I gave my first technical presentation and my company wouldn't let us travel so I gave the presentation over the telephone as did many of the other speakers. The next year, RETEC® was held in-person and the number of attendees was quite robust. It seemed that our members recognized the importance of face to face meetings. It is true that

virtual meetings are easier and more efficient in some ways but there is no substitute for direct interaction and relationship building between colleagues, associates, customers and suppliers.

This would have also been our last CAD board meeting for the current term and we are still trying to determine if we can set up a face to face meeting in a few weeks or if will we also be forced to also do a virtual meeting. Since the virus seems to be getting worse rather than improving (at least here in New York) it looks like we might need to have our board members call in rather than risk exposure. One of the reasons I had hoped that we could meet face to face was so that I could publically thank our board members for all of their excellent work this year during my term. Our committee chairs and their members do an extraordinary amount of behind-the-scenes-work that makes our division one of the largest and most successful in all of SPE.

I also wanted to express my sincere appreciation to a specific member of our Executive board who has made my job as Chair infinitely easier. Mike Willis was our executive secretary this year and has really done an amazing job at recording, publishing and informing us about past, present and future activities. In my estimation, being the executive board secretary is the most difficult and demanding position and Mike has handled this job with grace and precision. He is always stepping up and asking to help me with my duties to make things run more smoothly and anticipates what our next tasks and activities should be. Sun Chemical is very fortunate to have Mike as an employee and we are equally fortunate to have him serve on our board. Thank you Mike for your unparalleled service and contributions to Color & Appearance.

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As this is my final letter as Chair of this Division, I also wanted to express my sincere appreciation to all of you as Color & Appearance members and friends. I have really enjoyed my time serving on the board, presenting papers and keynotes and helping with various activities. The Color & Appearance Division boasts one of the largest memberships along with the best and brightest technical members who also publish and present highly informative (and sometimes entertaining) presentations. I have developed life-long friends and relationships within this division and am pleased to mentor and befriend the next generation of highly capable women and men who are rising in their careers and within our ranks.

Thanks for the opportunity to serve you in this capacity.

Doreen Becker

2019-2020 Chair
Color & Appearance Division

Call for Board of Directors Candidates 2020-2023

The Color & Appearance Division of the SPE will be conducting its annual Board of Directors elections. The election is open to current SPE members with CAD as their primary division. Time commitment would be for four meetings per year for 3 year terms. Two of the meetings will correspond with ANTEC® and RETEC® where you will participate in CAD activities and initiatives. Members of the Board participate in the planning, organization and running of CAD activities including ANTEC® programs, RETEC® programs, Technical Programs, Scholarship Programs & Funding, as well as offering guidance and advice to other SPE members interested in coloring plastic resins. The three year term will begin on July 1st 2020.

To be listed as a candidate or have questions about becoming a candidate, please Email a picture of yourself, educational background, employment (current and prior), and why you wish to be a candidate to:

Mark Freshwater
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SPE Color & Appearance Division Mission Statement:

The Color and Appearance Division of SPE strives to educate, train, inform, and provide professional interaction opportunities to the global community involved in visual performance and aesthetics of plastics.



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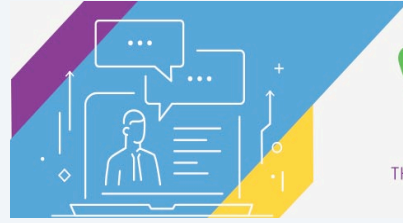
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CORONAVIRUS UPDATE

Dear Plastics Industry Colleagues:



While we were all optimistic that SPE’s annual ANTEC® conference could proceed as planned, the escalating concerns about COVID-19 and how it could affect our attendees’ health and well-being makes doing so impossible.

We will not be holding ANTEC® in San Antonio this year.

But, there is good news! Announcing ANTEC® 2020: The Virtual Edition.

ANTEC® is the premier knowledge-sharing and networking event for the plastics industry. So even though corporate travel bans and social-distancing requirements have made the networking part of ANTEC® impossible, the knowledge-sharing will go on!

We know you have a lot of questions. Please [see the following FAQs](#) for more information.

Thank you all for your patience and support as we worked together through this difficult decision!

We look forward to “seeing” you at ANTEC® 2020: The Virtual Edition.

Dr. Brian Landes
President

Patrick Farrey
CEO

TRACK: **COLOR AND APPEARANCE ANTEC® PROGRAM SCHEDULE** *April 21, 2020. Times are Eastern Standard*

8:00 - 8:30 **Characterization of Polycarbonate – Using Thermogravimetric-Rheology Analysis**
Jamal Al Sadi, Assistant Professor, Jadara University

8:45 - 9:15 **How Materials, Design, Processing and Tooling Affect the Aesthetics of Plastic Parts - Part 1**
Vikram Bhargava, Author, Consultant, Trainer, Vikpedia

9:30 - 10:00 **What Designers Need to Know About the Science of Color and Appearance of Plastic Parts - Part 2**
Vikram Bhargava , Author, Consultant, Trainer, Vikpedia

[Click here](#) For the full ANTEC®2020 schedule



Editor's Note



Welcome to the Spring Issue of CAD NEWS®. What a start to 2020. With the most recent event of the Corona Virus on everyone's mind, we wish everyone to be healthy and to stay healthy. These are unprecedented times and hopefully everyone is taking every precaution to stay safe.

ANTEC® 2020 has been moved to a Virtual event starting Monday, March 30th as it would have if it were the actual event. If you are registered for ANTEC® 2020, the Virtual Edition, you should have received you all access pass email Thursday March 26th. This will get you in to all the presentations being given. There will be over 160 presentations given and ANTEC® 2020, the Virtual Edition will be Monday through Wednesday over the next 5 weeks. That's is correct, ANTEC® will be 5 weeks long. Please see in this issue the CAD sessions which will be held on April 21st from 8:00 am (Eastern time) until 10:00 am. On SPE's website you will find the technical schedule for each section so look through and find a topic you want to learn more about and attend that session. It will be a different experience, but the bottom line is you will still get to learn about everything plastic.

2020 also brings us RETEC® in September in Orlando, FL at the Renaissance Sea World. The event will go back the traditional Sunday, Monday and Tuesday event starting September 20th and going to the 22nd. A strong technical program is being put together and if you feel you have a topic you would like present, there is still room in the program to add you. See the Call for Papers in this issue for details and important dates.



Please look through the sponsorship ads in this issue of the CAD Newsletter. Click on the ads to be taken to the respective website and learn as much as you can about the industry you are part of, the Color and Appearance of plastics.

I hope you enjoy reading through the Spring Newsletter and as always, if there is something missing or you would like to see in the Newsletter, do not hesitate to let us know and we will see what we can do.

Mark Tyler

Color and Appearance Newsletter Editor
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Abstracts due April 24, 2020

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Please submit your paper for CAD RETEC related to the following important topics:

- Color Measurement
- Testing and Quality Control
- Color Matching Techniques
- Processing and Equipment
- Materials (Colorants, Additives, Polymers)
- Property Retention/Durability
- Instrument and Test Methods
- Regulatory Issues
- Color Trends
- Decorative or Special Effects
- Other Color/Appearance Related Topics

*Title and abstract due: April 24
White paper submission by June 19
Submit to Alex Prosapio and Mark Tyler*

For more information or to submit your paper please use the following CAD RETEC® contacts:

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Mark Tyler, Silberline Manufacturing
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Milliken introduces KeyPlast RESIST™: A spectrum of bright, high-performance colorants for engineering plastics

New portfolio designed specifically for coloring polyamides and high-heat engineering plastics

Milliken & Company, recognized as a worldwide leader of plastic additives and colorants, announced the launch of KeyPlast RESIST™, a spectrum of bright, high-performance colorants for engineering plastics.

Polyamide resins and high-heat engineering polymers present unique challenges in the world of plastics. The materials of choice in demanding electrical, automotive and industrial applications, polyamide resins and high-heat engineering polymers are subject to high-temperature processing and require steady, reliable performance properties, making vibrancy of color difficult to achieve.

Milliken has addressed this challenge with its KeyPlast RESIST range of colorants. These products are specially designed for coloring engineering polymers such as polyamides, polyimides,

PBT polysulfones, PEEK, PPO and other high-heat resins and alloys. KeyPlast RESIST colorants can be used effectively with unfilled, glass-filled, and flame-retardant grades of various polyamide types such as polyamide 6, 66, 46, and other high temperature engineering polymers.

“Keyplast RESIST meets the strong requirements in another fast-growing application area—that of electrical vehicles and their charging system requirements,” said Sami T.K. Palanisami, Milliken Global Product Line Manager, Plastic Colorants.

The new range delivers the brilliant, consistent colors — including bright orange, yellow, red, blue and green—and the high-end properties that users demand. These colorants offer improved weather resistance and light fastness, are high purity and perform well in the high-temperature and chemically-reductive conditions typically associated with high-performance polymers.



Milliken introduces KeyPlast RESIST™: A spectrum of bright, high-performance colorants for engineering plastics. (Photos © 2020 Milliken & Company, all rights reserved, MKPR209)

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ADVANCES IN LASERMARKABLE ENGINEERING RESINS

Bruce M. Mulholland, Celanese



Abstract

Laser marking on plastics is growing in use. Bar codes and product lot data can currently be marked with lasers some commodity resins. However, of specific interest is the use of lasers to mark functional or decorative information on engineering resins. Because of their inert surface characteristics, these resins can be difficult to mark via printing using ink. This paper focuses on the development of specialty grades of engineering resins that yield excellent sharp, clear images when laser marked. Grades have been developed for laser marking white characters on black, dark characters on white and other effects.

Introduction

Over a quarter century ago, lasers were thought of as “tools of destruction”. From cutting through steel to use as weapons, lasers were powerful devices and thought to only be used that way. Of course today’s lasers carry a much tamer connotation and a much broader usage basis that is ever growing. With the technological refinement that has occurred, lasers are now used in delicate surgical procedures, sight lines for alignment, precision grinding and cutting, lithography, communications and for the marking of products. Laser marking on plastics, that is the marking and decorating of plastic parts, is of particular interest.

Laser marking on plastics is growing in use. Bar codes and product lot data can currently be marked with lasers at high speeds on some commodity resins. However, of specific interest is the use of lasers to mark functional or decorative information on engineering resins. Many engineering resins because of their inert surface characteristic have been difficult in the past to mark via printing using ink. It is extremely difficult, for instance, to pad print on acetal without surface treating with very harsh chemicals. And even if the ink “adheres”, the printed markings exhibit very poor wear characteristics and can be easily removed.

Laser marking is an excellent solution when problems in printing occur, or when there is a need for a truly indelible mark. For example in engineering resins such as polyester or nylon, functional components such as connectors and switches can be laser marked with the functional description without fear of the identification rubbing off. In other applications, decorative marks can be made such as company logos and trade names. These would include such items as car stereo trim plates,

electrical component housings and other miscellaneous goods where the part supplier requires an indelible mark.

This paper focuses on the development of specialty grades of engineering resins that yield excellent sharp, clear images when laser marked. Specifically grades have been developed for laser marking on general purpose parts including electronic components. Additional grades have been developed for laser marking on those applications requiring the utmost in ultra-violet (UV) light stabilization for both automotive and non-automotive applications. This paper is an extension of one presented at ANTEC™ 1997⁽¹⁾.

Traditional Marking & Labeling Technology

The most common methods for marking plastics today still include ink printing (both pad and ink-jet processes), ink filling, sublimation printing, embossing and stamping. Ink filling refers to the process of manually filling molded-in recessed areas with ink by injecting ink into these areas and wiping off the excess. Of course two-shot, two-color molding is another method to mark and label, albeit a very expensive one.

Of these traditional methods, ink printing is the most widely used. The primary benefits are the relatively low capital investment and the ability to print (pad print) on curved surfaces. The disadvantages to printing with ink are numerous and include:

- Non-permanent (relatively poor scratch and wear resistance and chemical resistance)
- Requires contacting the part surface
- Potential for smudged or illegible marks and labels
- Difficult to achieve on engineering resins
- Pre- and post-treatment processes typically required
- Environmental concerns including disposal of solvents and other chemicals
- Potential toxicity and/or flammability of certain solvents
- Maintenance of ink-jets and mechanical components
- Not flexible (manufacture of new die/transfer pad required for each new design)

Advantages of Laser Marking

In contrast to ink printing, laser marking of plastics provides excellent images without contacting the surface. Laser marking does require a higher capital investment. But economic analyses that take into account the facts of no consumable supplies required, no new dies/transfer

pads required for design changes, speed of design change, and no hazardous waste generation for emissions or disposal, will generally favor laser marking depending on the number of components to be labeled. Even at somewhat higher per part costs, laser marking offers significant advantages that include:

- Indelible marks
- Non-contact to surface
- Extremely sharp images without smudging
- No pre- or post-treatments typically required
- No solvent use and no associated disposal
- Precision placement of marks and letters, even on irregular or curved surfaces
- Quick design changes via programmable software
- 2-D-Symbology potential (ultra dense data capability)
- No adverse effect from part surface moisture
- Low operating cost (no consumable supplies to purchase such as ink)
- Low maintenance

Laser Marking on Plastics

The word laser is an acronym that stands for Light Amplification by Stimulated Emission of Radiation. The device itself emits a concentrated, precisely focused parallel beam of light. Lasers typically generate this light using an energy source, a lasing medium that allows the light to concentrate, and reflecting mirrors to direct the energy within the lasing medium. There are three types of lasers currently used to laser mark on plastics. They differ primarily in the wavelength of the resulting light energy. This is determined by the lasing medium used in the construction of the laser as described below.

TEA-CO₂ Laser

As the name implies, this laser uses carbon dioxide as the lasing medium (the acronym TEA stands for Transversal Excited Atmospheric pressure). The TEA-CO₂ laser operates at a relatively long wavelength of 10,600 nm. Images are typically produced using a mask that has the information etched into it. The laser fires its intense light through the mask. The resulting image is focused and redirected onto the object. The actual mark is achieved by the partial carbonization of the polymer due to the intense energy and creates an etch into the polymer with a depth typically in the range of 100 to 500 microns. The quality of mark is comparable to a dot matrix printer especially when marking at high speeds. TEA-CO₂ lasers are typically effective for simple coding such as lot numbering. However, high resolution graphics for appearance applications are better served by either of the other types of lasers. For acetal resins in particular, the major portion of the TEA-CO₂ laser energy is absorbed by the polymer matrix. This causes engraving of the surface without significant contrast.

Nd:YAG Laser

In contrast to the carbon dioxide laser, the Nd:YAG laser uses a solid state medium of Neodymium Doped Yttrium Aluminum Garnet. The YAG laser, for short, can be constructed to operate either at 1064 nm (near infrared) or doubled frequency at 532 nm (green light). In addition, triple frequency YAGs have recently been developed with operate in the ultraviolet region. Triple frequency YAGs are not as common as fundamental or double frequency YAG lasers. The material's response to the triple frequency would be similar to the Excimer laser discussed later.

YAG lasers are typically interfaced with a computer to generate the graphics using a vector process achieved with focusing mirrors (see Figure 1). The YAG laser in a sense writes on the surface of the plastic part. Since no masks are required, design change and flexibility are improved versus the TEA-CO₂ laser. And with the higher frequency, the distinctness of image is also far superior compared to the TEA-CO₂ laser.

When operated at the 1064 nm wavelength, the YAG laser creates a mark by melting and foaming the polymer surface. Unlike the TEA-CO₂ laser, this surface interaction occurs only to a depth of about 50 microns. When excellent contrast is obtained (bright white mark on a black substrate), the foaming occurs to about 40 microns. By adjusting frequency and power, the amount of foaming can be altered and the color of the resulting mark can be made darker.

Frequency doubled Nd:YAG lasers operate with a wavelength in the visible region at 532 nm (green light) and typically effect pigments and other additives that absorb at that wavelength. The resulting color change is due to a photochemical process occurring to these pigments and additives rather than from melting and foaming of the polymer. However, if very high peak laser output is used, localized heating of the polymer can still occur resulting in melting and foaming.

YAG lasers are becoming increasingly popular for laser marking appearance applications. They are particularly suited for developing a light mark on a dark plastic part. To this end, lasermarkable engineering resins were specially formulated to enhance the contrast of a white mark on a black part using the YAG laser. These resins include acetal copolymer, polyester (PBT) and polyester elastomers, and nylon (long fiber technology grades).

Excimer Laser

The Excimer laser generates UV light in the wavelength range of 193 nm to 351 nm. Here the laser marks totally by a photochemical process and the polymer matrix is not thermally loaded. Excimer lasers typically act on titanium dioxide or other mineral fillers to generate a dark mark on a white or light colored substrate. Relatively high levels of pigment or filler are necessary to achieve acceptable contrast. Since the process is

photochemical, little to no etching occurs on the polymer surface. Marks penetrate to depths typically less than 40 microns. Excimer lasers have limited use for marking plastics today primarily due to being more expensive than Nd:YAG lasers and their limited ability to only produce a dark mark on a light substrate.

Lasermarkable Acetal Copolymer Resin

Because the Nd:YAG laser is the preferred marking device for developing high contrast marks on a dark substrate, development of a specialty lasermarkable grade of acetal copolymer was focused on that laser type. In particular, the objective was to develop a lasermarkable black formulation that yields the highest possible contrast when marked with the Nd:YAG laser. To that end, black lasermarkable acetal copolymer was developed using patented technology. This resin yields extremely white, high contrasting marks as shown in Figure 2.

Conventional black grades show little to no contrast. Typical applications for general purpose lasermarkable resins include appliance buttons and knobs, keypad keys, miscellaneous switches and incremented thumb wheels, and floppy disk shutters. An application such as functional and decorative markings on an electric razor take advantage of the wear and chemical resistance of the laser mark, as well as those same properties of the base acetal copolymer resin.

Building upon this patented technology, a UV stable, lasermarkable resin was developed for interior automotive and other applications. This resin combines the laser marking ability with the world-class ultra-violet light stability and can be laser marked with the Nd:YAG laser to produce excellent white marks with no yellowing caused by the UV stabilizer system. The mark produced on this UV grade is of the same high contrast as depicted in Figure 2.

UV stabilized, lasermarkable acetal copolymer meets all current automotive interior weathering requirements including the 1240.8 kJ/m² exposure requirement which is the highest standard in the industry. This resin is designed to be used in automotive interior functional components such as cassette stereo buttons, hood and trunk release levers, or cruise control buttons. In these applications, the parts can be laser marked with the functional description without fear of the identification rubbing off as currently can occur with ink printed components. In other applications, decorative marks can be made such as company logos and tradenames. An example is a car stereo trim plate marked with either the logo of the automaker or the stereo manufacturer.

Lasermarkable Polyester Resins

Polyester (PBT) resins can also be modified using proprietary technology to achieve contrasting white marks on a black substrate. However, it must be understood that

since PBT has higher intrinsic whiteness than other resins mentioned so far, the whiteness of the mark is not as bright as achieved with acetal or nylon. Also, the black substrate color is not as black as in these other resins. This results in the overall effect not having as much contrast as acetal or nylon. While the contrast may not be suitable for decorative finishes, it is clearly legible for use in functional marks or for identification purposes on such items as electrical connectors or components. Here, where product traceability is required more and more, bar codes or 2-D symbology may be employed capture such information as product and date codes, lot information, manufacture date, manufacturing plant, and so on.

Polyester resins may include unfilled, glass filled, impact modified or mineral filled resins. These may also include polyester elastomers and alloys and blends. As in the case for nylon, the general rule is as the filler content increases, the apparent contrast decreases.

Polyester resins also generally include flame retardant versions. Depending on the laser type, flame retardant polyester resins can be inherently lasermarkable for functional markings. For example, flame retardant PBT natural and light colored grades generally exhibit a black mark when marked with the Nd:YAG laser. The contrasting dark mark is generally acceptable for identification marking as long as the base color is not too dark. Darker colors including black in flame retardant resins will generally require modification to allow a contrasting lighter colored mark

Lasermarkable Long Glass Fiber Nylon Resins

Nylon 6 or Nylon 6,6 based long glass fiber resins can be modified using proprietary technology to achieve high contrast white marks on a black substrate. These grades can include heat stabilizer packages for under the hood applications, or UV stabilizers for interior or exterior applications. As a general rule, as the amount of glass fiber increases, the lower the contrast achieved in the resulting mark. For example, a long glass fiber nylon 6 containing 40% glass will achieve higher contrast marks (whiter looking marks) compared to a 60% glass reinforced product. Applications for lasermarkable long glass fiber nylon resins include turn signal stalks, tool housings and various under the hood parts where the mark is required to withstand harsh environmental conditions.

Lasermarkable PPS and LCP Resins

Both polyphenylene sulfide and liquid crystal polymer are very opaque resins. As a result, lasermarking on black substrates modified to enhance lasermarkability will achieve marks with reasonable contrast, but not as high in contrast as achieved with other resins like acetal. Again, the marks are of acceptable contrast for functional or informative marks, but may not have enough contrast to be considered for decorative marks. Since these resins

Technical Article- continued

find applications in computer systems and other electronic systems, indelible traceability and identification marking is extremely important, particularly for the automotive and aerospace industries. Both PPS and LCP resins are generally lasermarkable in their natural state depending on the laser employed. In particular, both PPS and LCP resins generally exhibit a contrasting dark mark on natural and light colored resin using a Nd:YAG laser. As the color of the substrate moves darker, the less contrast will be observed unless the formulation is specifically modified to enhance lasermarkability.

The Future in Color

While the initial focus of laser marking has been on developing a high contrast white mark on a black substrate, the possibility of developing a colored mark is intriguing, but challenging. A colored mark would no doubt expand the usage of laser marking and allow greater design flexibility for the customer.

Currently, the Excimer laser will yield a grayish to black mark on a light colored substrate. That is one option for color other than the white mark, albeit a limited one. The Nd:YAG laser offers seemingly more potential for marking colors. In acetal resin for example, laser marking with the YAG laser on a medium to dark color

will yield a mark which is lighter in color and similar in hue. For instance, marking on a dark blue acetal part with the YAG laser will yield a light blue mark.

Building on this lasermarking technology, it may be possible in the future to expand the palette of colors when marking with the YAG laser. Possibilities include high contrast colored markings on a black substrate. Our initial successes in this area have included blue, green, yellow, or red marks on a black acetal substrate. What's more, it may be possible in the future to expand on this by developing technology which creates a colored mark on a colored substrate of different hue.

Conclusion

In conclusion, if your application calls for indelible, high contrast marks, combining lasermarkable engineering resins with the Nd:YAG laser will produce the brightest, highest contrasting white marks on black molded parts, that can be achieved in industry today. Equally important, this combination truly eliminates any problems associated with ink printing adhering onto acetal and other resins, and removes any worry concerning the mark wearing off.

References

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2. Haack, K. Kurz, K. Witan, and G. Lauck, "Non-Contact Marking by Laser Beam", *Hoechst AG*, translated from *Kunststoffe* 83, No. 7, p. 878-882 (1993)
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Figure 1
Nd:YAG Laser Schematic

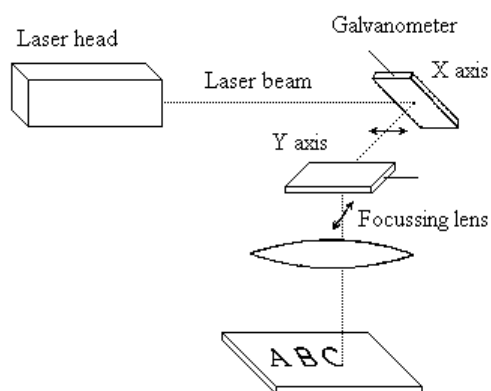


Figure 2
High Contrast White Lasermark on Black POM





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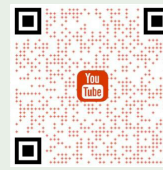
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Scholarship Opportunities

This is an SPE CAD Scholarship Information Reminder for the 2020/2021 School Year. The Society of Plastics Engineers Color and Appearance Division have scholarships available for qualified individuals.

Each year, scholarships are awarded in honor of some of those who have influenced our industry through education of up to \$4,000 each. Additional full or partial scholarships may be awarded based on available funding and on the number of qualified applicants.

Jack Graff Memorial Scholarship	up to \$4000.00	Gary Beebe Memorial Scholarship	up to \$4000.00
Bob Charvat Memorial Scholarship	up to \$4000.00	Steve Goldstein Memorial Scholarship	up to \$4000.00
George Rangos Memorial Scholarship	up to \$4000.00		

For questions on applications or process
please email [Ann Smeltzer](mailto:Ann.Smeltzer@spe.org), or call her at 412-298-4373



Connect With SPE CAD Via Social Media

Please connect with us at any of the following Social Media sites by simply clicking on the logos below.

Join SPECAD's Group On LinkedIn to network with industry peers, participate in group discussions of industry and technical topics, find job opportunities, and get the latest division and conference announcements.

Group Name: SPE Color & Appearance Division
Group ID 152108
<https://www.linkedin.com/groups/152108>



BOARD MINUTES

The CAD Division posts the board minutes as soon as approved and they are accessible on our website.

[Click here](#) to review our board minutes.

INVITATION TO ATTEND OUR BOARD MEETINGS

The Color and Appearance Division regularly holds Board of Director (BOD) meetings at the ANTEC® and the CAD RETEC®. In addition, a Summer BOD meeting is typically held about 6 weeks prior to the next CAD RETEC®.

The Summer meeting is scheduled in various locations. A Winter BOD meeting is held in January. The Winter meeting is typically held at a site of a future CAD RETEC®.

Any SPE CAD members who wish to attend are welcome at these meetings. If interested in attending the next Board meeting, please contact the Division Chairperson for more information.

Spring 2020



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Note: remove xxx after ampersand in email addresses before emailing – added here to prevent bots from capturing email.

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