



COLOR &
APPEARANCE

CAD NEWS[®]
FALL 2023 NEWSLETTER

RETEC 2023

TECHNICAL ARTICLE

OPTIONS FOR YOUR HIGH VOLUME COLOR - BLUE

*Scott Heitzman, Global Product Manager
Sun Chemical Performance Pigments*

MEMBER SPOTLIGHT



FALL 2023 CHAIRMAN'S MESSAGE

Hello and welcome to September, and the 2023 Fall edition of CADNEWS®. I am grateful to be given the honor to be the 2023-2024 Chairperson and the opportunity to work with a great group of volunteers that make up the Color and Appearance Division Board of Directors.

First, I would like to recognize and thank Michael Willis for an excellent year as last year's Chairperson. Mike did an exceptional job and we appreciate his tireless service throughout the years. I also would like to thank the past chairs and look forward to continuing in their footsteps of success. In addition, the CAD Board welcomes two newly elected members, Bennett Chin and Corey Singleton to a three-year term.

As the summer months flew by, CAD Board Members have been busy preparing for this year's RETEC, "Colorful Columbus", being held at the Hyatt Regency Columbus, OH, September 18-20, 2023. Kimberly Williamson, Steve Esker and their team have been working hard to ensure another successful show. We have a very good technical program, and a panel discussion that will be focused on Regulatory Concerns. The panel will also feature a speaker from the FDA, so you don't want to miss it! Being in Columbus, the conference is centrally located so we are expecting great attendance. Hope to see you there!

A big "Thank You" to all our sponsors at this year's RETEC. Through their support, we can conduct our annual RETEC conference, provide technical education, award college scholarship money, and continue the support of SPE Plastivan which provides education to the next generation of our industry. Please be sure to click on their links and learn more about them.

I would be remiss if I did not thank the support of the companies that allow all of us to support CAD - from the Board of Directors to RETEC attendees. Collaboration and education are essential, and we are pleased that these companies recognize the value of this.

In closing, I look forward to a productive year working with a great group of volunteers as CAD Chair. Please do not hesitate to contact me with any comments or suggestions for the Color and Appearance Division, and I look forward to seeing you in "Colorful Columbus"!

ALEX PROSAPIO

Color and Appearance Division Chair
aprosapio@sudarshan.com

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CONTRIBUTORS

Newsletter Editor

Mark Tyler

Newsletter Committee

Scott Heitzman

Doreen Becker

Communications Committee Chair

Betty Puckerin

Newsletter Technical Content

Coordinator

Scott Heitzman

Communications Committee

Jeff Drusda

Earl Balthazar

Matt Billiter

Scott Heitzman

Mark Tyler

Ann Smeltzer

Mark Ryan

Mercedes Landazuri

Newsletter Technical Content Committee

Betty Puckerin

Michael Willis

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Milliken presents

Milliken: The Color Experts

Milliken & Company understands the power and value of color as it relates to branding. Humans are visual creatures, and color plays a key role in purchasing decisions, as it helps to inform, personalize and speak the brand language.

The company continues to tap into its vast experience in this space to develop solutions for a wide variety of end markets and end-use applications.

Milliken's color journey began in 1964, when it launched its proprietary Versatint® washable colorants for textile identification. In 1981, it introduced its Reactint® range of colorants for polyurethane (PU). Five years later, Milliken unveiled its ClearTint™ polymeric colorants for use in NX® UltraClear™ polypropylene (PP), which can be made only with its Millad® NX® 8000 clarifier.

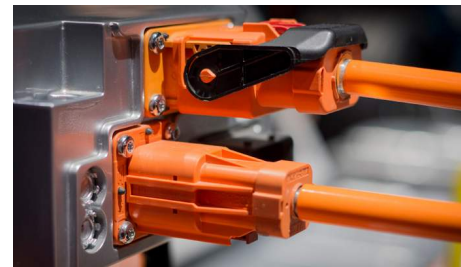
The year 2019 marked a major step forward, with the introduction of both its KeyPlast® products, as well as its KeyPlast RESIST™ high-performance colorants for plastics.

Milliken technology helps to color a vast range of sectors, including agriculture and turf; automotive and transportation; building and construction; coatings, paints and inks; home and laundry care; and plastics.

Milliken's KeyPlast RESIST colorants address another key challenge — coloring high-performance engineering polymers with bright and vibrant hues. These colorant are used in the high demanding applications such as high voltage connectors, control systems, structural parts and metal replacement.

Using KeyPlast RESIST colorants compounders and resin producers, offer a vast spectrum of stable and reproducible colors suitable for use with a wide range of resins such as Polyamides, PPA's, Poly Sulphones and other high heat polymer blends and alloys.

Additionally, Milliken continues to keep its finger on the pulse of end-user and market trends, which it documents each year in its ColorDirection report that forecasts the key shades and hues for the coming year. In doing so, it offers a palette of carefully curated colors, while providing the stories behind the inspiration and motivation driving their popularity. Brand owners can leverage this expert information to help capture the mood of consumers through effective branding and personalization.



Milliken's diverse portfolio of colorants can enable product makers to realize their aims to deliver on those colors that will help drive and shape consumer preferences in the coming year.

From the R&D lab to the production floor, Milliken's Chemical Division stands ready to help customers leverage color to design new products, reinvigorate existing products, and create opportunities to grow in new markets and applications.



For more details and information please contact us or visit us online at chemical.milliken.com

EUROPE : eurochem@milliken.com | NORTH AMERICA : millichem@milliken.com
LATIN AMERICA : lachem@milliken.com | ASIA : asiachem@milliken.com



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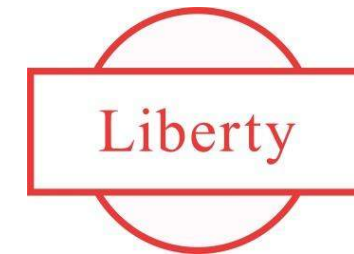
CAD RETEC® 2023 Sponsors



Registration fees for attendees are kept low in part by the generous donations of corporate and individual sponsors. We'd like to say a special thanks to these generous sponsors and recognize their support of the conference.

Watch for sponsorship signs during the conference to see which event each of the companies below sponsored.

Platinum Sponsors



Gold Sponsors



TRUST CHEM
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Silver Sponsors



2023 CAD RETEC® Events Summary

2023 CAD RETEC® Tabletop Exhibitors

Company	Company
AMI	Milliken & Company
Barentz	MIXACO USA
Brilliant Group	NGF Canada Limited
Buckeye Color & Chemical Co.	Oxerra
Chroma Specialty Chemicals	Paramount Colors Inc.
CINIC America	PCBL, Ltd
Colour Synthesis Solutions	ROHA USA
Covia	Royce Global
Datacolor	Silberline
Day Glo Color Corporation	Sincol USA
DCL Corporation	Spectra Dyestuff Inc.
Eckart America	Sudarshan North America
EMD Electronics	Sun Chemical
Exciton	The M Holland Company
First Source Worldwide LLC	The Shepherd Color Company
H.L. Blachford Ltd.	Tomatec
Heubach Group	Torrecid USA
Intercoastal Sales & Management	Tronox
Keim-Additec USA LLC	Trust Chem USA, LLC
Kuncai Americas, LLC.	United Mineral and Chemical Corporation
Leistritz Extrusion	US Silica
Liberty Specialty Chemicals	Vibrantz Technologies
Lintech International LLC	Vivify Company
Mayzo Inc.	X-Rite
Milana Colors LLC	Yipin USA

WELCOME RECEPTION

Sponsored by Milliken & Company

Franklin Room 2nd Floor

Monday, September 18th

8:00pm – 11:00pm

Join us for cocktails, networking, light snacks and live jazz

Complimentary with Registration

Use the **GREEN** drink tickets.

5K Fun Run/Walk

To benefit Habitat for Humanity

Wednesday, September 20th

Hotel Lobby at 7:00am

Start your morning off right. Join us bright and early for a fun run/walk around the local area. You'll be back to catch the first paper.

EVENT COORDINATOR: Scott Heitzman

EVENT SPONSOR: DCL

Free T-Shirt for the first 40 runners



Cost: \$25
CAD will match your donation!

Exhibit Schedule

Regency Ballroom 3rd Floor

Tuesday, Sep 19th

10:00 am to 7:00 pm

Networking Reception

Tuesday, Sep 19th

5:45 pm to 7:00 pm

Wednesday, Sep 20th

9:00 am to 3:30 pm

(closed during lunch)

Phone Charging Station

Sponsored by Tomatec

Technical Session Water Station

Sponsored by Torrecid

Raffle Reception (Wed 4:30 pm)

Sponsored by Liberty Specialty Chemicals

Tuesday Breakfast

Sponsored by DCL

Franklin Room 2nd Floor

Tuesday, September 19th

7:30am – 9:00am

Complimentary with registration!

Awards Luncheon

Sponsored by Tronox LLC

Franklin Room 2nd Floor

Wednesday, September 20th

12:00pm – 1:30pm

Complimentary with registration!

Networking Reception

Sponsored by Shepherd Color

Regency Ballroom 3rd Floor

Tuesday, Sep 19th

5:45 pm – 7:00 pm

Use the **GOLD** tickets for drinks. Complimentary with registration!

CAD Survey Raffle:

Delaware Room 2nd Floor

Wednesday, September 20th

4:30 pm

Complete your Survey and drop it off at the Registration Desk for your chance to win. Grand Prize: Bose QuietComfort Headphones plus many other great prizes!
* Must be present to win *

Key Cards

Sponsored by Sun Chemical

Lanyards

Sponsored by Sudarshan

Conference Internet:

Sponsored by Royce Global

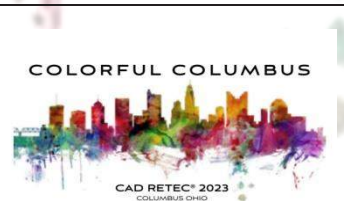


Get the SPE Event App

1. Download the app from your app store (Android or iOS) using the QR code or <https://www.4spe.org/cadretec23app>
2. Enter your e-mail address used to register for CAD RETEC®
3. Set up your password or click the "Send me a magic link"
4. Select the "SPE-Inspiring Plastics Professionals" organization
5. Select "SPE Color & Appearance Conference 2023"

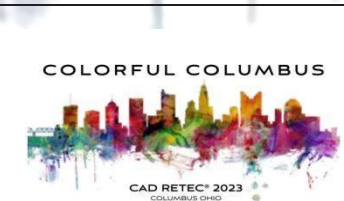
Hospitality Suites

While the SPE CAD does not sponsor hospitality suites, we realize the importance of these functions to the conference attendees. Check hotel monitors and signs for times and locations of other suites operating during CAD RETEC® 2023



CAD RETEC® 2023
 Technical Program
Tuesday, September 19, 2023
Delaware Room 2nd Floor

Moderator	Mark Tyler	<i>Silberline</i>
8:55 AM	Opening Remarks	Kimberly Williamson, <i>Techmer</i>
9:00 AM	Keynote: Do Robots Dream of Plastic Sheep? The Effect of AI on Plastics Industry	Mark Ryan, <i>Shepherd</i>
9:30 AM	Pigment Purity Remains a Key Element of Sustainable Colors	Romesh Kumar, <i>Heubach</i>
10:00 AM	Break (Regency Ballroom 3rd Floor)	Sponsored by Heubach
10:30 AM	Comparing the Migration of Genotoxic Impurities in Colorants to Their Total Extracted Content – An Analysis of Plastic Additive Risk in Food-Contact Applications	Eric Andrews, <i>Colour Synthesis Solutions</i>
11:00 AM	Panel Discussion: Regulatory Concerns Eric Andrews, Colour Synthesis Solutions Frank Lavieri, Paramount Colors Dr. Lillian Mawby, Food and Drug Administration David Wawer, Color Pigments Mfrs. Association (CPMA)	Moderator: Betty Puckerin, <i>Ampacet</i>
12:00 PM	Lunch on your own	
Moderator	Mark Freshwater	<i>Paramount Colors</i>
1:30 PM	Keynote: Effect of Additives on the Color & Appearance of Plastics	Bruce Mulholland, <i>Celanese (retired)</i>
2:00 PM	High Heat Pigments for E-Mobility	Breeze Briggs, <i>Sun Chemical</i>
2:30 PM	The Performance Impact of Laking Monoazo Organic Pigment Red 48	Bonnie Piro, <i>Sudarshan</i>
3:00 PM	Break (Regency Ballroom 3rd Floor)	Sponsored by Trust Chem
3:30 PM	Keynote: The Post-Pandemic Digital Changes in the Plastics Industry	Christine Gehres, <i>SpecialChem</i>
4:00 PM	High-irradiance Laboratory Weathering Testing of Plastics	Andy Francis, <i>Q-Lab</i>
4:45 PM	New Technology Forum (see separate schedule)	Scott Heitzman - Moderator
5:45 PM	Networking Reception (Regency Ballroom 3rd Floor)	Sponsored by Shepherd



CAD RETEC® 2023
 Technical Program
Wednesday, September 20, 2023
Delaware Room 2nd Floor

Moderator	Mike Willis	<i>Sun Chemical</i>
8:55 AM	Welcome Day 2	Kimberly Williamson, <i>Techmer</i>
9:00 AM	Keynote: CMF Developments for Plastics: Sustainability Perspectives	Doreen Becker, <i>Ampacet</i>
9:30 AM	Achieve Greater Sustainability with Performance for Plastics with New TiO2 Innovation	Jeff Drusda, <i>Chemours</i>
10:00 AM	Break (Regency Ballroom 3rd Floor)	Sponsored by EMD Electronics
10:30 AM	Additives for Durable, Flexible, and Accurate Laser Markings in Plastics	Kevin Lucero, <i>EMD Electronics</i>
11:00 AM	Heat Stability = Color Change, True or False?	Curtis Ross, <i>DCL Corporation</i>
11:30 AM	Keynote: NIR absorption in plastics: Consequences and solutions based on pigments	Daniel Llado, <i>Vibrantz Technologies</i>
12:00 PM	Awards Lunch (Franklin Room 2nd Floor)	Sponsored by Tronox
Moderator	Jack Ladson	<i>Color Science Consultancy</i>
1:30 PM	L* is a Valuable Component for Color	Phil Niedenzu, <i>Chemours</i>
2:00 PM	Keynote: The Power of the Collective Mind in CMF Design	Narss Lipinid, <i>CMF Design Consultant</i>
3:00 PM	Break (Regency Ballroom 3rd Floor)	Sponsored by Vivify
3:30 PM	The Status of SPE: Inspiring Plastics Professionals	Bruce Mulholland, <i>SPE</i>
4:00 PM	Improved Dispersion of Organic Pigments in Polyesters and Final Product Physicals, without Impacting Printing and Label Adhesion.	Frank Neuber, <i>Clariant</i>
4:30 PM	Closing Remarks & Raffle (must be present to win!)	Kimberly Williamson, <i>Techmer</i>
5:00 PM	Conference Ends	



Regulatory Concerns

Panel Discussion: Tuesday at 11:00 am

This panel will discuss regulatory concerns regarding food contact regulations, updates on TSCA, and concerns facing color suppliers today. Dr. Mawby will present an overview of the FCN process for new materials. David Wawer will present an update on TSCA. Frank Lavieri will present potential sources for impurities in colorant manufacturing. Eric can provide answers regarding testing. Questions from the audience are encouraged!

Panelists: Eric Andrews, Technical Services Manager, Colour Synthesis Solutions
 Frank Lavieri, EVP Commercial & Pigments, Paramount Colors
 Dr. Lillian Mawby, Regulatory Research Scientist, FDA
 David Wawer, Executive Director, Color Pigments Mfrs Association

Moderator: Betty Puckerin, Color Technology Global Manager, Ampacet

New Technology Forum: Delaware Room 2nd Floor
Tuesday, Sep 19th

Don't miss the chance to hear about new offerings from these exhibitors
See schedule below. Moderator: Scott Heitzman, DCL Corporation

4:45p	Introduction	5:20p	Colour Synthesis Solutions
4:50p	X-Rite	5:25p	Sun Chemical
4:55p	DCL	5:30p	Silberline
5:00p	Heubach Group	5:35p	Tronox
5:05p	Vivify Company	5:40p	The Shepherd Color Company
5:10p	Sudarshan North America	5:45p	PCBL, Limited
5:15p	US Silica	5:50p	Paramount Colors

2023 CAD RETEC® Committee		
Chairperson	Kimberly Williamson	<i>Techmer PM</i>
Vice-chairperson	Steve Esker	<i>Paramount Colors</i>
Technical Program	Alex Prosapio Karen Carlson TJ Stubbs Tony Tanner	<i>Sudarshan</i> <i>EMD Electronics</i> <i>Teknor Apex</i> <i>Baerlocher USA</i>
New Technology Forum	Scott Heitzman	<i>DCL Corporation</i>
Audio/Visual	Mark Freshwater	<i>Paramount Colors</i>
Exhibitors	Brian West	<i>West Color Technologies</i>
Registration	Bruce Mulholland	<i>Celanese (retired)</i>
Sponsorship	Cheryl Treat Scott Aumann	<i>Sun Chemical</i> <i>OptiColor</i>
Technical Content Review	Mark Ryan	<i>The Shepherd Color Company</i>
Printing/Publicity/Website	Betty Puckerin Jeff Drusda George Iannuzzi	<i>Ampacet</i> <i>Chemours</i> <i>Koel Colour US</i>
Fun Run/Walk	Scott Heitzman	<i>DCL Corporation</i>
Golf Outing	Mark Tyler	<i>Silberline</i>
Raffle	Chuck Depew	<i>Holland Colours</i>



PlastiVan® at CAD RETEC®

Tuesday, September 19th

Room: Fairfield (2nd Floor)

Join PlastiVan® on **Tuesday** as it brings **Positive Plastics Education** to students from Circleville Middle School at CAD RETEC®. Themes for the day will include **Color our World through Polymer Science**. See the classically campy **Science of Color** PlastiVideo sponsored by CAD.

Interested CAD RETEC® attendees who would like to see the PlastiVan® program in action are welcome to join our presentation in the Fairfield room (2nd floor). PlastiVan® schedule:

- 8:30a Students Arrive at the hotel
- 9:00a Students view CAD RETEC® tabletops
- 10:00a PlastiVan® program
- 12:00p Lunch
- 1:00p Students Depart hotel

Help us change the perception of plastics one classroom at a time!



CAD RETEC® 2024

CALL FOR PAPERS

Tampa Marriott Water Street
Tampa, Florida
September 23 – 25, 2024

Deadline for Abstracts is February 2024

Chairperson: Alex Prosapio, Sudarshan
aprosapio@sudarshan.com

Vice-Chairperson: Mark Tyler, Silberline
tylerm@silberline.com

Technical Program: TJ Stubbs, Teknor Apex
tstubbs@teknorapex.com



Society of Plastics Engineers Color & Appearance Division Endowment Scholarship Program for the 2024 – 2025 School Year



The Endowment Scholarship Program offered by the Color & Appearance Division of the Society of Plastics Engineers awards multiple scholarships each year to students who have demonstrated or expressed an interest in the coloring of plastics industry. The students must be majoring in or taking courses that would be beneficial to a career in this industry. This would include, but is not limited to, plastics engineering, polymer science, coloring of plastics, chemistry, physics, chemical engineering, mechanical engineering, industrial design and industrial engineering. All applicants must be in good standing with their colleges. Financial need is considered for most scholarships.

Undergraduate and graduate scholarships range up to \$3,000 annually. Scholarships are awarded for one year only, but applicants may apply for a re-award for each year they are enrolled in school.

Scholarship Eligibility

1. Applicants for these scholarships must be full-time undergraduate students in either a four-year college or a two-year technical program or enrolled in a graduate program.
2. All applicants must be graduates of public or private high schools.

Scholarship Criteria

1. Applicants must have a demonstrated or expressed interest in the coloring of plastics industry.
2. Applicants must be majoring in or taking courses that would be beneficial to a career in the coloring of plastics industry.
3. An applicant must be in good academic standing with his or her school.
4. Preference is given to student members of SPE and also to students who have a parent(s) as a member of the Color & Appearance Division of the SPE.
4. Financial need of an applicant will be considered for most scholarships.

Application Procedure

To be considered for a scholarship from the Color & Appearance Division Endowment Scholarship Program, applicants must complete an application and return it to the address specified on the application by **June 7, 2024**. All applications submitted must include:

1. A completed application form.
2. Three recommendation letters: two from a teacher or school official and one from an employer or non-relative.
3. A high school and/or college transcript for the last two years.
4. An essay by the student (500 words or less) telling why the applicant is applying for the scholarship, the applicant's qualifications, and the applicant's educational and career goals in the coloring of plastics industry.

For more information, visit www.specad.org or contact Ann Smeltzer at (412) 298-4373 or e-mail at ann.smeltzer@heubach.com

All scholarships will be paid directly to the recipients' schools. The Color & Appearance Division Endowment Scholarship Program will not award scholarships to applicants who are not qualified and reserves the right to not award a scholarship in a given year if it so chooses.



Call for Candidates

Color & Appearance Division
Board of Directors



WE NEED YOUR HELP – CONTINUE THE EXCELLENCE!

- Interested candidates for the 2024 Board of Directors should contact George Iannuzzi or any Board Member, or indicate your interest on the questionnaire
- We will be soliciting candidates through the end of 2023
- Biographies due February 2024
- Elections will be conducted in Spring 2024
- If elected, term is 3 years (serve until 2027)
- There are 4 Board meetings per year to attend: Spring, Summer, CAD RETEC®, and Winter meetings
- Candidates must be members of SPE in good standing and members of the Color and Appearance Division



MEMBER SPOTLIGHT

cory singleton

WE WANT TO INTRODUCE OUR BOARD MEMBERS TO THE CAD MEMBERSHIP

tell us about yourself.

I work for a company called Vivify and support their industrial segment as an Account Manager. Vivify is a distributor of pigments and additives and supports a variety of industries.

I'm based out of my home office just outside of Fort Worth, TX and support customers all across the United States. I originally grew up in Cincinnati, OH and attended the University of Cincinnati.

My wife Kaylen and I have a daughter, Margot, who recently turned two months old. We also have two dogs named Hank (Pitbull) and Harvey (boxer).

when did you join the board?

This is my first term on the board. I officially joined the board in July of 2023.

how long have you been attending cad meetings and/or been a member?

Last year was my first year attending, however I have been in the color industry for 5 years and the specialty chemical space for the last 7 years.

what do you like about the cad group and our meetings?

I enjoy getting to see all of the trends in the industry today and what the future of our industry looks like. I also enjoy hearing all of things that each company is doing to innovate and stay at the forefront of color technology.

any fun facts about you?

HOBBIES

I love spending time with my family and working out.

HIDDEN TALENTS

I love music and play both the drums and guitar. I was a cheerleader in college.

FAVORITE SPORTS TEAMS

As a native of Cincinnati, OH I am a Bearcat / Bengals fan at heart.



Sudarshan develops and manufactures a broad range of high quality organic and inorganic pigments, solvent dyes and mica effect pigments for the plastics, coatings, inks and cosmetics industries.

Sudaperm™ Sudafast™ Sudacolor™ Sudatherm™ Sudasol™ Sumica™

SUDARSHAN

growing together...
Sudarshan Global - Technology - Environmentally Sustainable

You know who we are

You know how to contact us

You know what we offer

Real Solutions for today's challenges

paramount colors, inc.

TOMATEC

Leading Manufacturer of Complex Inorganic Color Pigments (CICP)
Pigment Brown 24, Yellow 53, Blue 28, Green 50, Black 28, etc.

- Environmentally Friendly Pigments; Brown 48, etc.
- Laser Marking Pigments

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7914 Tanners Gate Lane Florence, KY. 41042
TEL: (859) 746-0407 FAX: (859) 746-0467
tomatecam@tomatec.com | www.tomatec.com



SPE Color and 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.

INVITATION TO ATTEND CAD BOARD MEETING

The Color and Appearance Division (CAD) holds 4 Board of Directors (BOD) meetings each year, either in person or virtually. Any CAD members in good standing with in SPE and has Color and Appearance as their selected division are welcomed to attend these meetings. If interested in attending these meetings, please contact the current CAD Chairperson or any BOD for more information.

CADNEWS® Technical Content – Scott Heitzman

The Technical Content portion of our Fall 2023 edition of CADNEWS® Includes a solid reference for formulating your highest volume color – Blue. The pigment selection for blue is limited but extremely high functioning. That's if you select correctly for your application. Take a look at this ANTEC paper for some technical background and color what's new in blue!

CADNEWS® Color Notes – Scott Heitzman

Welcome CADNEWS® Color Notes. The idea is to create discussion and provide comments regarding questions you may have related to color and appearance, color measurements, and colorants in general. Do not miss your opportunity to anonymously ask our team of experts a question. Use the link below to submit your questions. Our SPECAD Color Notes committee will provide a response to one or more of the submissions in the upcoming CADNEWS® letter.

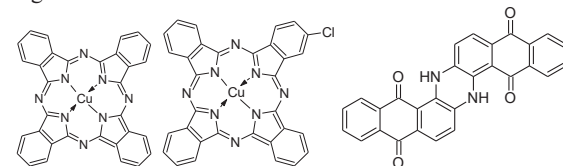
<http://specad.org/color-questions-for-cad/>

When it comes to creating blue colors using organic pigments, today's formulators have a limited, but high functioning selection to choose from—specifically phthalocyanine (pcn) and indanthrone blue. Pigment Manufacturers have developed a new range of indanthrone pigments for polymers and coatings. This article will review this new Alpha Crystal of Pigment Blue 60 versus the “next best alternatives.”

A range of high performance pcn blues were used for comparison to these new PB 60's. Be aware that all PCN blues are not alike chemically and performance in application. The products used in this study are tailor made pigments that are designed for a specific application. Thus two sets of pigments were used in this study—a set containing pigments for plastics and a set for coatings. This includes a variety of crystals forms and stabilization methods for the pcn.

The chemical structures for pcn blue and indanthrone can be seen in **Figure 1**. All of the pcn and indanthrone pigments have the same or similar structure to those displayed. Most are altered in performance and color by the crystal structure. The method of stabilization for these polymorphous pigments accounts for differences in the chemical structure and performance in application. This is displayed by the chlorine substituent used to stabilize the pcn Pigment Blue 15-1.

Figure 1



These organic pigments, in general are two times smaller than their inorganic counterparts. Both are robust molecules that have fastness properties that out perform their particles size. The pcn accomplishes this with its large aromatic structure and the indanthrone with its rigid fused polycyclic form. The crystal form or shape can also have an impact on dispersion, shear resistance and flocculation. In general, platelets and rod particles are easier to disperse and have fewer tendencies to flocculate than those that are isometric. In **Figure 2a,b,c**, the photomicrographs show the differences between the chemical pigment types and the plastics and coatings versions. Note the Plastics PB

60 (figure 2c) with rod shaped primary particles ~0.1 to 2µm long, 0.03 µm wide and the Coatings PB 60 (figure 2b) with much smaller particles ~0.04-0.08 µm. This is by design as the larger particles are needed for dispersion in the lower shear plastics applications and the smaller particles provide the transparency and strength required in coatings.

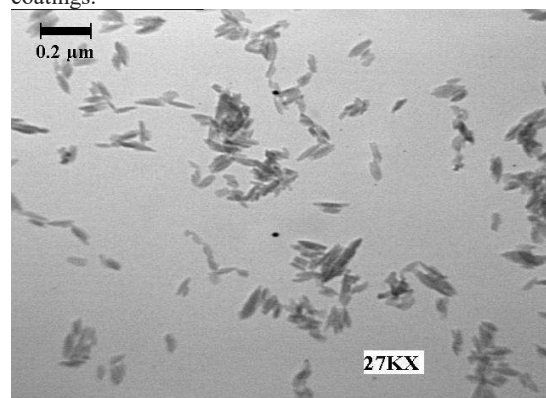


Figure 2a PB 15:2 stabilized

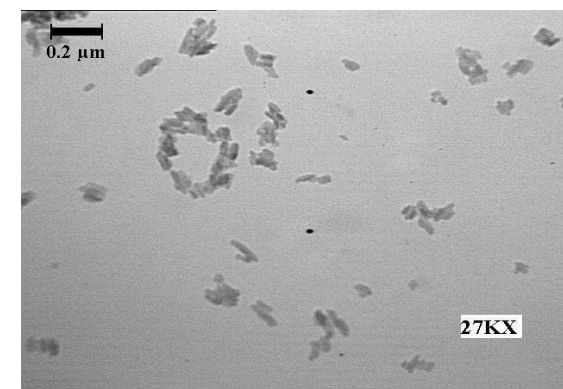


Figure 2b PB 60 Alpha Crystal Coatings

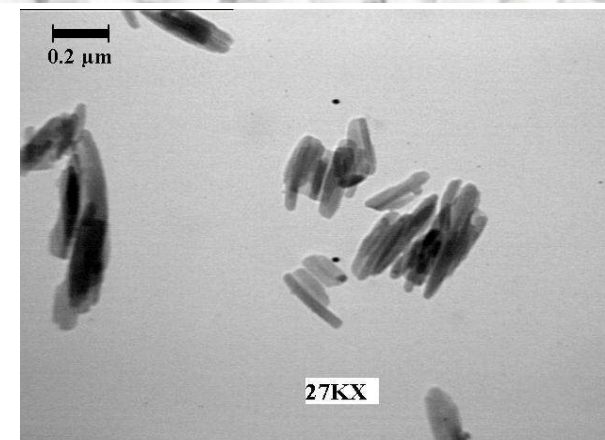


Figure 2c PB 60 Alpha Crystal Plastics

Particle size distribution is also important. Disc centrifuge is commonly used in evaluating pigments. The particle size sample preparation for disc centrifuge (sedimentation method) uses ~10.0mg of sample that is dispersed for 1 min in 1% DISP W30 in DI water using a horn sonicator. Then about 1 ml is then injected into the disc centrifuge.

The mode (peak) is the particle size. It's common to report the median weight diameter (or D50). Since these are distribution by weight the larger particles can be overestimated in the overall distribution relative to the smaller particles. Thus, this is a relative weight distribution. Since larger particles weigh more, they count more by weight than equal number of smaller particles. There is no direct relationship between the size (height) of the bands within a distribution and the actual amount of particles of that size. This is a motivating factor to also consider photomicrographs.

The particle size data in **Figure 3a,b,c** is broken into a set for coatings(a), plastics(b) grades and a comparison between the two(c). As seen in the photomicrographs, the plastics grades are slightly larger to provide the required ease of dispersion. Coatings products are driven to a smaller size to provide required transparency. In the plastics set, the PB 60 has a mode of 275nm as compared to the red shade phthalocyanine blues at 300-600nm respectively. In the coatings set the PB 60 is much smaller with a mode of 73 nm.

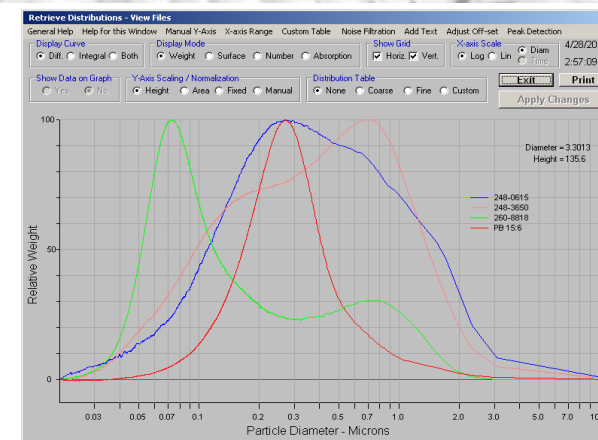


Figure 3a Coatings Grades

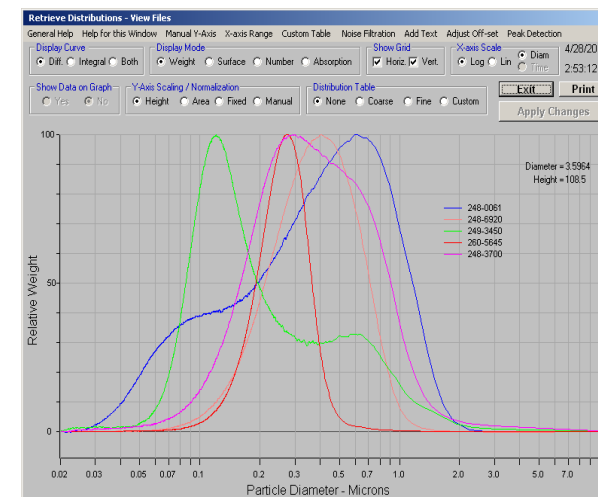


Figure 3b Plastics Grades

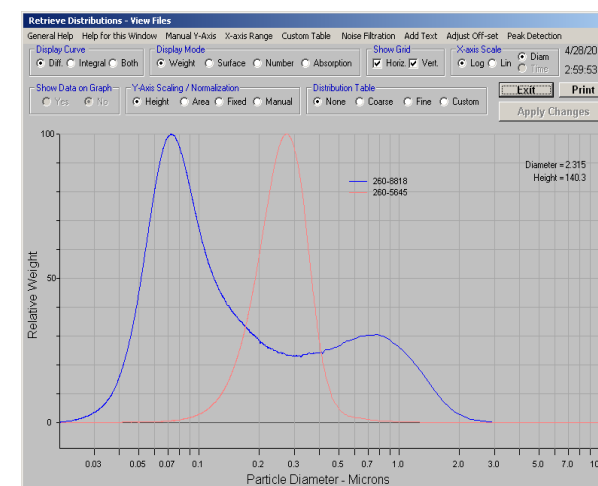


Figure 3c Coatings vs Plastics Grade

In the **polymer or plastics formulations**, PB 60 is used for its ability to provide a spectral match to its higher volume use in exterior coatings, formulate very red shade blues, provide added light fastness, warpage and bleach resistance. The following data sets review results of tests

comparing the next best alternatives. The product set includes:

- PB 15:1 stabilized
- PB 15:1 HemiCl
- PB 15:1 MonoCl
- PB 15:4 stabilized
- PB 60 Alpha Crystal

Nylon heat stability testing is conducted using 0.1% pigment with 1.9% TiO₂. The compound is mixed and extruded. A base chip is molded at 260° C. Temperatures are then raised in 15-30° C increments and the resulting chips are measured versus the base chip. Color difference is reported in DE CIELab and used for comparison. All products performed well and are considered commercially acceptable in nylon for fiber and injection molding applications.

Bleach testing is conducted on molded nylon chips containing 0.1% pigment with 1.9% TiO₂. Chips are submerged in a 3 % NaOCl solution for 24 hours. Color difference readings are taken versus the unsubmerged portion of the chip and reported in DE CIELab for comparison. All products demonstrated little color change after 24 hours.

Warpage testing is conducted in HDPE on a 2% pigment compound that is extruded and then molded. Color chips are placed in an oven at 100° C for 72 hours and are measured versus an unpigmented control chip. Delta L and Delta W numbers of less than ±5 may be considered as low warp; however, numbers of less than ±3 are preferred. PB 60 outperformed all but the heavily stabilized .PB 15:4.

Pigment Type	Delta L	Delta W
P.B. 60	-1.73	0.52
P.B 15:1	10.5	7.3
P.B 15:1	4.67	6.3
P.B 15:1	1.46	2.1
P.B 15:4	2.6	0

Delta L and Delta W numbers of less than ±5 may be considered as low warp; however, numbers of less than ±3 are preferred.

Color data was compiled using nylon “tint” chips containing 0.1% pigment with 1.9% TiO₂ and “masstone” chips containing 0.5% pigment. Figure 4a displays the photo of the masstone and tint chips. The a* versus b* color plots also exhibit the same trend. It is important to note the large difference in color between the three (3) red shade blues! Keep in mind when specifying pigments. PB 15:1’s are not all the same in performance or color. They are made to meet specific specifications.

The color in the photo transitions from green to red. The ‘jet’ and very red masstone explain why the Blue 60 Alpha Crystal is valued in thin cross-section applications like film and fiber. Truly a unique color point, that is difficult to reach with blends of other pigments.

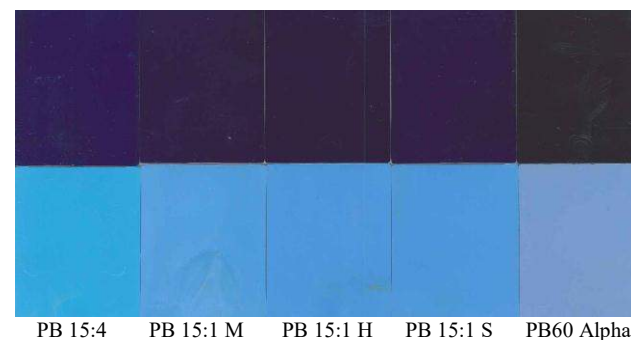


Figure 4a Photo

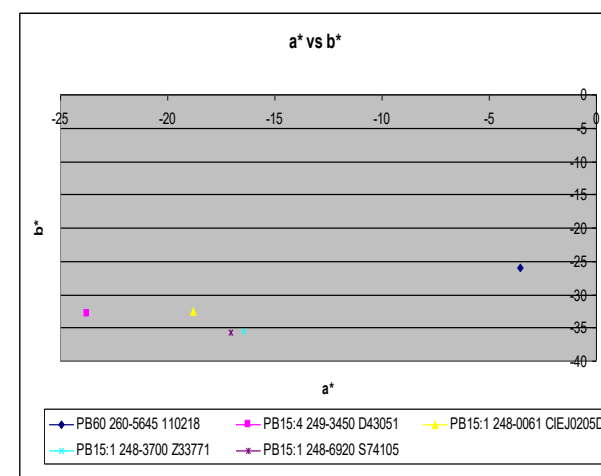


Figure 4b Tint

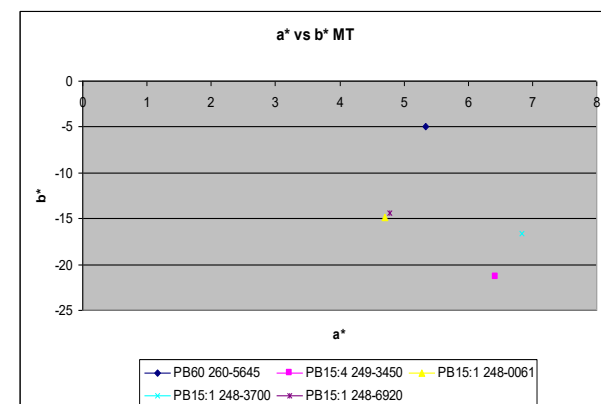


Figure 4c Masstone

In coatings formulations, PB 60 is used by itself and mixtures with pcn to provide a wide range of solid and

metallic red-shade blue. It is noticeably redder than the pcn and is thus used to tint or where a reddish shade is desired. PB 60 provides better light fastness than historical blends of violet pigments and pcn (the weak component being violet). It is reported to provide higher solids formulas due to its lower rheology. Its transparency has made it the “go to” blue for metallic and effect coatings. The following data sets review results of application tests comparing the next best alternatives.

The product set includes:

- PB 15:6
- PB 15:2
- PB 15:2 stabilized
- PB 60 Alpha Crystal

Color data is from an acrylic enamel test (a general solvent borne test). A grind vehicle is milled with pigment and then let down at 5 parts pigment 95 parts white for the tint, figure 5a. The figure 5b is a* versus b* color plot for masstone or 100% pigment. The figure 5c is a photo of the displays. It is clear the advantage or differentiation of the PB 60.

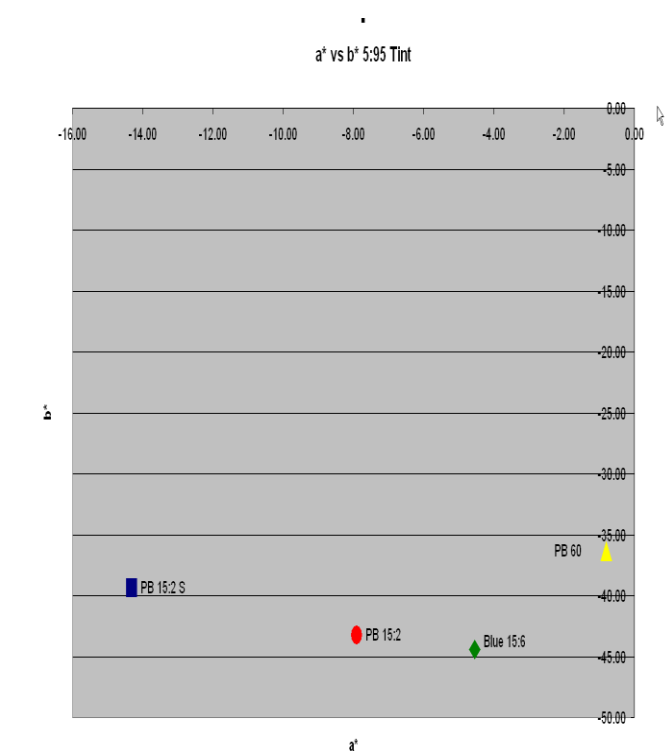


Figure 5a tint

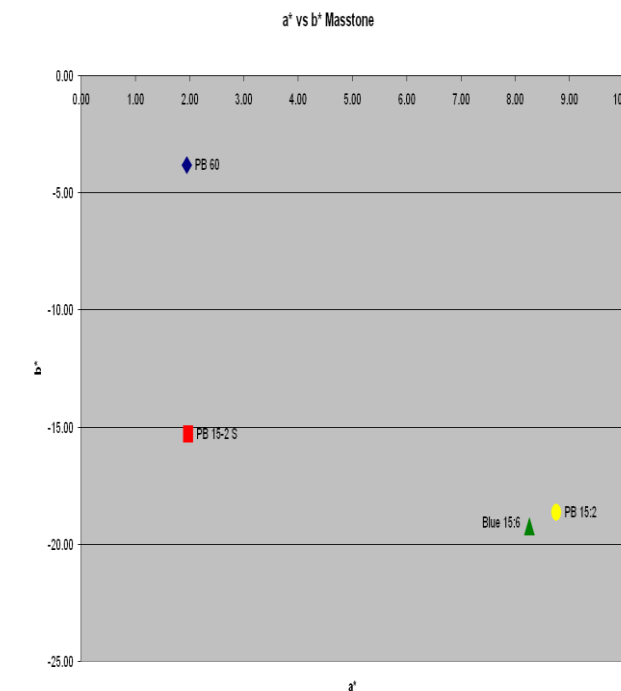


Figure 5b masstone

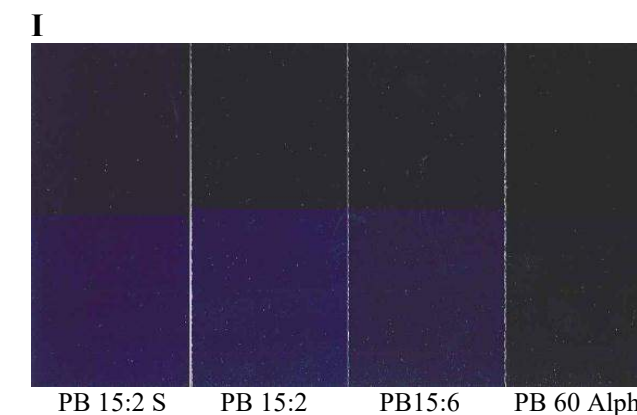


Figure 5c photo MT over black and white

Solvent bleed is tested on a gram of pigment enclosed in filter paper and suspended in the test solvent. Pigment is submerged for 16 hours at room temperature. Color change of the solvent is expressed on a 1-5 Gray Scale where indicates poor resistance and 5 represents no change. All samples in the coatings set were 4-5 in Acid, Alkali, butyl acetate, methyl ethyl ketone and xylene.

In conclusion, whether you need the performance advantages in polymers or coatings, the products are available. Newly developed Pigment Blue 60 - Alpha Crystal offers advantages in both performance and color gamut extension.

Although data presented above is believed to be correct, Sun Chemical makes no guarantee to its accuracy, completeness or reliability. It’s important to evaluate pigments in your specific test procedures, loadings and end use applications to assure “fit for use.”

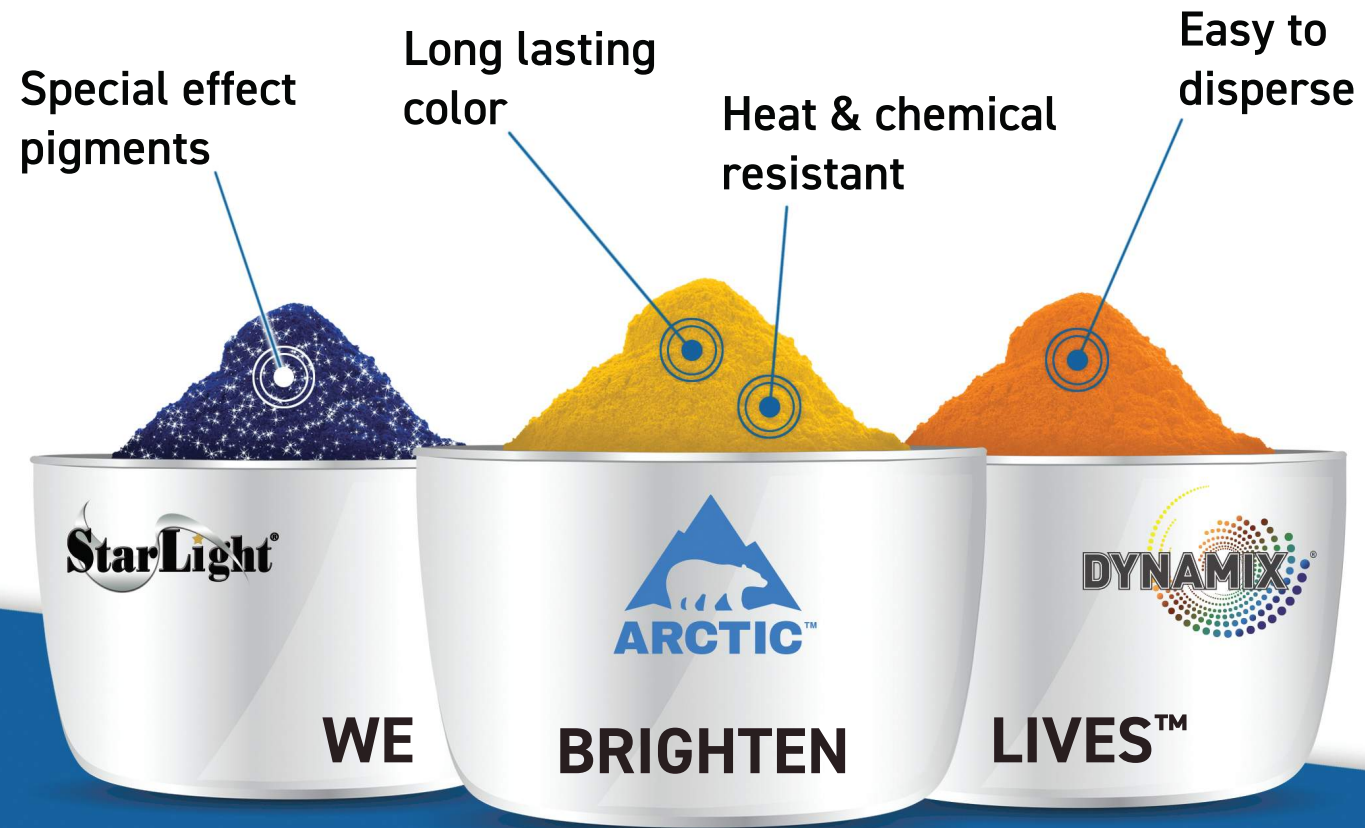
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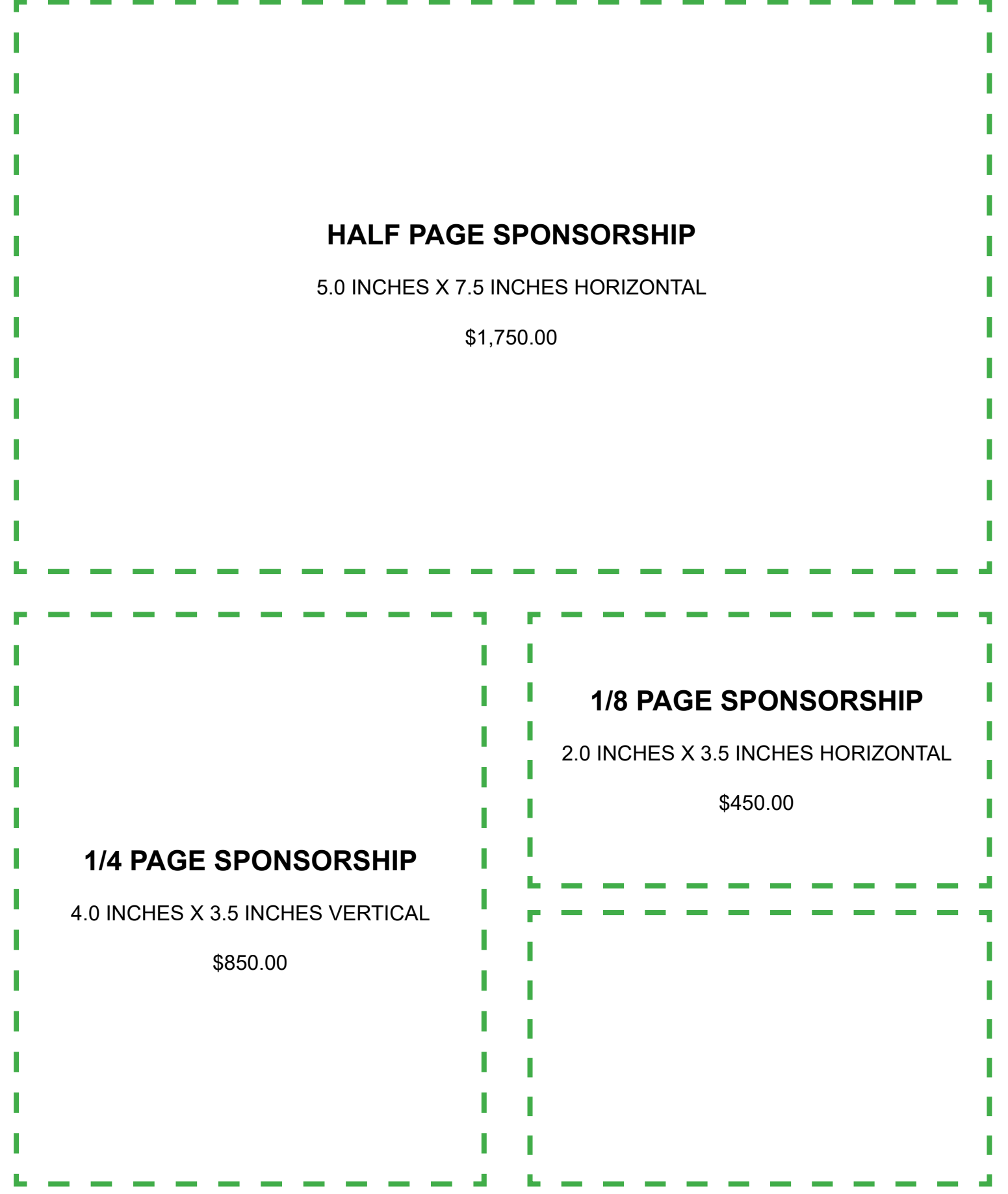
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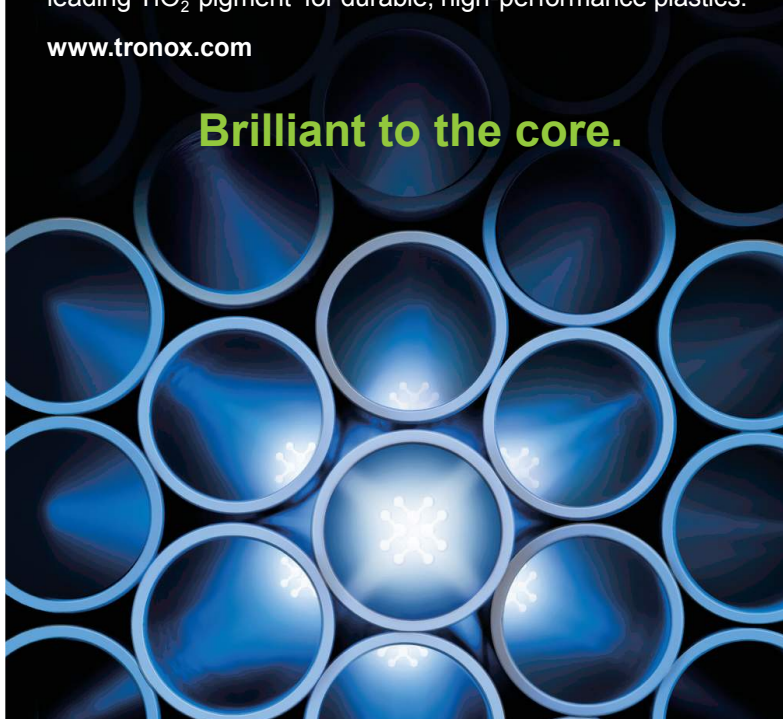



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DIRECTORS until 2024

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DataColor
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Brian Coleman, 859-525-5814
Celanese
Brian.Coleman@celanese.com

Ed Ford, 302-745-3319
MIXACO
ford@mixaco.com

Josh Jacobs, 419-575-4806
Uniform Color
Joshua.Jacobs@audia.com

Jack Ladson, 267-981-7112
Color Science Consultancy
jack@ColorScienceConsultancy.com

Bruce Mulholland, 859-982-5256
Celanese (Retired)
captcolour@aol.com

Cheryl Treat, 313-570-3911
Sun Chemical
cheryl.treat@sunchemical.com

Brian West, 865-805-0702
West Color Technologies
cadexhibits@gmail.com

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DIRECTORS until 2025

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Holland Colours Americas, Inc.
cdepew@hollandcolours.com

Jim Figaniak, 215 736-1126
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jfiganiak@americhem.com

Bruce Howie, 905-823-3200
H.L. Blachford
bhowie@blachford.ca

Scott Heitzman, 513-708-9142
DCL Corporation
sheitzman@pigments.com

Betty Puckerin, 812-466-9828
Ampacet Corporation
betty.puckerin@ampacet.com

Mark Ryan, 513-874-0714
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mryan@shepherdcolor.com

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Karen Carlson, 914-536-7241
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karen.carlson@emdgroup.com

Jeff Drusda, 302 683 8025
Chemours
jeffrey.drusda@chemours.com

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Steve@paramountcolors.com

Christine Gehres, 973-641-4852
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Christine.Gehres@specialchem.com

Cory Singleton, 513-967-4861
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cory.singleton@vivifycompany.com

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