spe
COLOR & APPEARANCE

CAD NEWS®

WINTER 2021 NEWSLETTER

2022ANTEC® Save the Date

2022RETEC® Save the Date

MAKE A SPLASH WITH COLOR II

CAD RETEC® 2022

Bismuth Vanadate for Plastics

By Mark Freshwater, DCL Corporation

CAD NEWS®

WINTER 2021 NEWSLETTER

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Hello and Happy December to you all. I hope everyone is having a great start to the Winter season, and as cold and snow starts to creep into our everyday lives, I would like to take a minute and welcome you to the Winter Issue of CADNEWS® wish everyone a very happy upcoming Holiday Season. As this year's Chairperson and also Newsletter Editor, I get to combine an editorial with a recap of the past year and what to look forward to in 2022. Many good things did come of 2021 and looking forward, there are quite a bit of good things to come.

To start, let's step back a couple months and take a look at the Atlanta RETEC®. The Live RETEC® where for many, we were able to mingle and network like the old days. Exhibitor booths were a plenty and although we did miss a few of you due to travel restrictions, the space was alive with vendor / customer conversations that we missed out on in 2020. The Technical program was again a great example of the support from this division and so many great topics were shared, most live, some virtual. The New Technology Forum was a full schedule of exhibitors showcasing new products for a pretty decent audience. Final number of paid attendees wrapped up at 266.

Typical RETEC® is about 450 so not quite a full show but all things considering a great showing. I would to give huge shout out to Betty Puckerin for Chairing this event and her Vice-Chairs Kimberly Williamson and Karen Carlson. She and her team had to deal with an ever-changing environment and kept up and produced a fine event. Every day there seemed to be a new challenge and for those who made to the event, saw all the hard work these people put in to make it all fall out seamlessly. And to Alex Prosapio, TJ Stubbs and Andrew Smith for putting together the Technical Program. We also would like to thank the Sponsors and Exhibitors that stuck with the program and supported the 2021 RETEC. Without this support of the Sponsors and Exhibitors, we could not have the best Color and Appearance Technical Conference in the world. Thanks to all from the CAD BOD and the CAD membership for your continued support. You will find the Sponsors and Exhibitors in the edition of the CADNews. At RETEC 2021 we also awarded Jim Figaniak the Terry Golding Outstanding Achievement Award for his exemplary work for the BOD over the years and his continued work today. Thank you, Jim and well deserved.

Looking ahead, two SPE conferences are scheduled to be live in 2022. In June, ANTEC is scheduled for two live days of events and technical presentations in Charlotte, NC. In September, RETEC will be in Orlando where we had to postpone and put on the Virtual 2020 RETEC. You can find information on both these events in this newsletter with save the dates and ways to be involved. We have up coming elections to the Color and Appearance BOD in the Spring. Solicitations for Candidates are just starting and how to be included as a candidate is in this issue. We are also soliciting CADNews sponsors to 2022 so if you wanted to be included as a sponsor in the Newsletter, there is information in this issue in how to do just that.

Thanks for reading the CADNews Newsletter and hoping you find some good content and information about the Color and Appearance Division. Please reach out to any of on the Newsletter Committee with ideas or comments. It is also appropriated.

Hoping everyone has a wonderful Holiday Season and look forward to providing you more great content and information in the Spring.

Mark Tyler
2021-2022 CAD BOD Chair

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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.

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***

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CAD RETEC® 2021 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.

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2021 TERRY GOLDING OUTSTANDING ACHIEVEMENT AWARD

JIM FIGANIAK

This year's recipient of the Outstanding Achievement Award was Jim Figaniak. Jim has been a committed and active Color and Appearance Board of Directors member for more than twenty years. As a member, Jim peers elected him to the Executive Committee in 2009 serving one year each of the five officer roles including BOD Chairperson in 2012. Jim assumed the responsibilities of RETEC Technical Program Chair in 2014 and continues to serve in that capacity today. He has also Chaired the Strategic Planning committee since 2016 in addition to chairing the Site and Theme Committee. The Site and Theme Committee plays a key lead role in vetting future sites for the annual RETEC conference. Jim is a dedicated leader and is always willing to do whatever it takes to get the job done. A memorable example of Jim's commitment and dedication was RETEC 2005 when Hurricane Katrina's impact on New Orleans, the host city, put the annual conference in jeopardy. The organization and coordination of a RETEC host site typically takes 1-2 years of advanced planning. With just six weeks to work, Jim volunteered to step in and successfully coordinated the move to Charlotte. That is just one of the many contributions Jim has made as a CAD BOD member and it is not only about what he has done, but how he does it. Jim is one of the most kind and humble people you will ever meet. It is always for the good of the group or the team and never about himself. This award is named in honor of the late Terry Golding who exemplified these values during his years of service as a board member and it was a privilege to present the award to Jim this year. Congratulations Jim and Thank You!

ANNUAL END OF CONFERENCE RAFFLE MC'ED BY SCOTT AUMMAN AND KIMBERLY WILLIAMSON

SPE CAD-RETEC has been supporting HfH since 2005 when Hurricane Katrina struck the Gulf Coast causing catastrophic damage from central Florida to eastern Texas. That year, SPE CAD-RETEC was held in Charlotte, North Carolina and in support of the vast rebuilding that would take place, SPE CAD-RETEC donated 25% of the profits from the event to HfH. Since that time the relationship between the two organizations has grown.

For the last 15 years, DCL has supported the Habitat for Humanity in their mission to bring people together to build homes, communities and raise hope through sponsorship of the 5K Fun Run. This past September we were in Atlanta, GA, and DCL once again hosted the annual 5K Fun Run. It raised almost $1000. We are grateful to the runners who helped make this possible, as well as the matched donation made by the Society of Plastics Engineers Color and Appearance Division.

In this photo we have Frank Lavieri (DCL, EVP Sales and Marketing) presenting the cheque to Peggy Still Johnson (Habitat for Humanity).

CALL FOR PAPERS

Save the Date

Renaissance Sea World
Orlando, Florida
September 12th – 14th 2022
(Monday to Wednesday Event)

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spe CAD RETEC®
Orlando, Florida • September 12-14, 2022
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ANTEC® 2022 SAVE THE DATE

June 14-15, 2022; Charlotte, NC

ANTEC® showcases the latest advances in industrial, national laboratory and academic work. Papers will share findings in polymer research and/or new and improved products and technologies.

SPE is hosting ANTEC® 2022 in-person, co-located with PLASTEC® South, an Informa event, in Charlotte, NC, June 14-15. PLASTEC® South is a comprehensive annual plastic design and manufacturing event for plastics professionals, suppliers and buyers to discover innovation, engineer new technology, and to expand their networks. ANTEC® 2022 will also include an online component.

The presentations at the in-person event will be selected/invited based on the applicability of their topic across a wide cross-section of the plastics value chain. Presentation/speaker selection, which will occur through a paper submission/review process and/or through invitation, will be considered based on the quality, relevance and newness of any research done in the field as well as the speaker's position in the plastics industry. Technical Papers that are not selected for in-person ANTEC® will be recorded and delivered virtually over a schedule that will be announced soon.

Society of Plastics Engineers Color and Appearance Division

Call for Board of Directors Candidates

2022 to 2025 Term

The Color & Appearance Division of the SPE will be conducting its annual Board of Directors elections April 2022.

SPE CAD Board of Directors
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.

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

Michael Willis
Sun Chemical
PH: (513) 592-4370
michael.willis@sunchemical.com

All candidates must be identified and have all their information to SPE CAD BOD by March 19th, 2022

Visit SPECAD Website for more information

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.

MICHAEL WILLIS AND MARK TYLER OF SPE CAD PRESENTING A CHECK FOR $5,000 TO EVE VITALE OF THE SPE FOUNDATION TO SUPPORT THE MAKING OF VIDEO'S FOR THE UPCOMING WEEKS OF LEARNING

SPE CAD Scholarship Information Reminder for 2022 / 2023 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

Application will open up on May 1st, 2022
For questions on applications or process please email Ann Smeltzer, or call Ann at 412-298-4373

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CADNEWS® Winter 2021 Technical Content – Scott Heitzman

The Technical Content portion of our Winter addition of CADNEWS® includes a recent paper presented at RETEC 2021. The paper is titled Bismuth Vanadate for Plastics and was presented by Mark Freshwater with DCL Corporation. This is a great reference, if you had a chance to see the presentation at RETEC or an excellent first time read.

CADNEWS® Winter 2021 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/

TECHNICAL ARTICLE

BY MARK FRERSHWATER, DCL CORPORATION

BISMUTH VANADATE FOR PLASTICS

Abstract

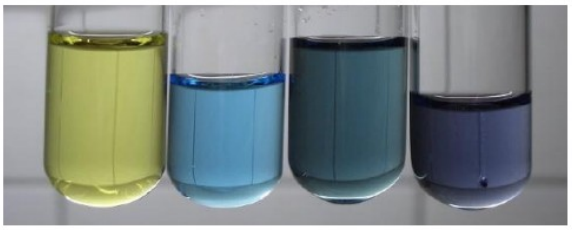
Bismuth Vanadate, Pigment Yellow 184 was introduced as an inorganic pigment in the mid 1980's. Its usage and value in plastics has grown; however, I believe Pigment Yellow 184 is often overlooked as a candidate when a high-performance Yellow is needed for plastics. BV can be used in a wide range of polymers including PVC, Polyolefins, and various Engineering resins. I will discuss both the benefits and limitations regarding BV's for plastics. The points to be referenced will include Heat Stability, possible oxidation or redox reaction, color shift, dispersibility, shade range, opacity, and variations of Pigment Yellow 184 that make them more suitable for select polymers.

Key Properties of Bismuth Vanadate Pigment Yellow 184 in Plastics

Bismuth Vanadate is a bright Yellow that can range in color from green shade to lemon shade. The heat stability in plastics typically ranges from 260°C to >320°C depending on the BV type. Pigment Yellow 184 is also known to have high saturation and good opacity. It also has very good weathering properties in both full shade and tint. The weatherfastness rating is 5 in masstone and 4-5 in tint. BV also has excellent migration and chemical resistance and the influence of warparge is very low.

Polymer Compatibility PVC – rigid and flexible

Bismuth Vanadate can be used in both rigid and flexible PVC; however, one should proceed with caution. Pigment Yellow 184 will initially offer the expected favorable characteristics of being a bright clean yellow that is easy dispersing. It will also perform well with respect to migration and chemical resistance. The UV performance or the exterior durability are what needs to be monitored as it may not perform as well as expected. Vanadium has 5 valence electrons that can be lost producing multiple states of vanadium oxidation. PVC generally has low thermal stability and exposure to heat during processing and or light after processing can initiate the degradation process. The degradation process produces hydrochloric acid which will aggressively react with the Vanadium causing the color to shift from a clean bright yellow to a brownish blue. (see below) This can be controlled to some degree with polymer stabilization so that any HCL formed is neutralized. Minimizing the amount of heat and energy the PVC is exposed to during processing is also beneficial in controlling the thermal degradation process.



+5	+4	+3	+2
Valence Electrons			

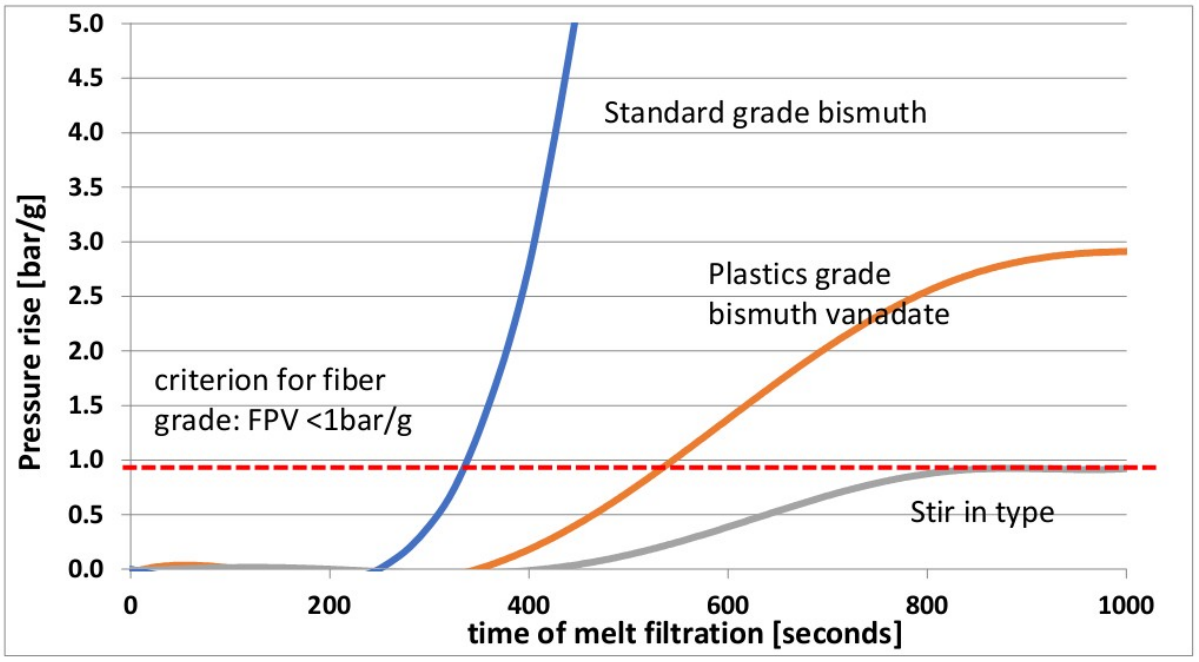
Polymer Compatibility Engineering Polymers -Polyamide, Polyester, and Styrenics

Bismuth Vanadate is a good candidate for the coloration of engineering polymers with the recommended grades having a heat stability between 275°C-320°C. BV pigment by itself can be stable up to 400°C; however, when incorporated into a polymer at elevated temperatures the vanadium is exposed to the organic material which will catalyze vanadium oxidation resulting in a color shift. This reaction will produce the same result as the one referenced above regarding the exposure of vanadium to HCL. In this case; however, the reaction can be prevented by protecting the BV crystal from coming in contact with the polymer. This can be achieved by encapsulating the pigment, typically with boric acid or silicon dioxide, providing a protective spacer between the pigment and the resin. The encapuslation can also have a postive effect on acid, alkali, and SO2 resistance.

Polyamides chemical corrosiveness, along with processing temperatures in the 300°C range, limit the range of yellow pigments that can be used successfully. Bismuth Vanadate can be used alone or shaded with CICP's and select organic pigments that meet the processing and end use requirements. The heat stability of Bismuth Vanadate for Polyamides has traditionally been improved with the addition of boric acid. The heat stability of Bismuth Vanadate treated with boric acid for use in PA is >320°C albeit with some caveats. The release of water during the extrusion process will need to be controlled and polymer hydrolysis can be a factor. Polymer hydrolization, particularly with polyester and polycarbonate, should be monitored especially when the concentration of boric acid is >10% of the total formulation. If this occurs the physical properties of the polymer will be negatively impacted. Appropriate handling protection and regulatory compliance will also need to be followed if boric acid containing products are being used.

There are some newer generation BV's that do not contain boric acid. The most recent generation products that are boric acid free have a heat stability up to 300°C in HDPE and 320°C in polyamide. They also have very good color strength when compared to other yellow pigment chemistries the work in polyamide. Boric acid free products also have a higher chromaticity when compared to Boric acid containing BV's along with greater global regulatory compliance. Work also continues in an effort to improve the FPV of boric acid free types to make them more suitbable for fiber applications.

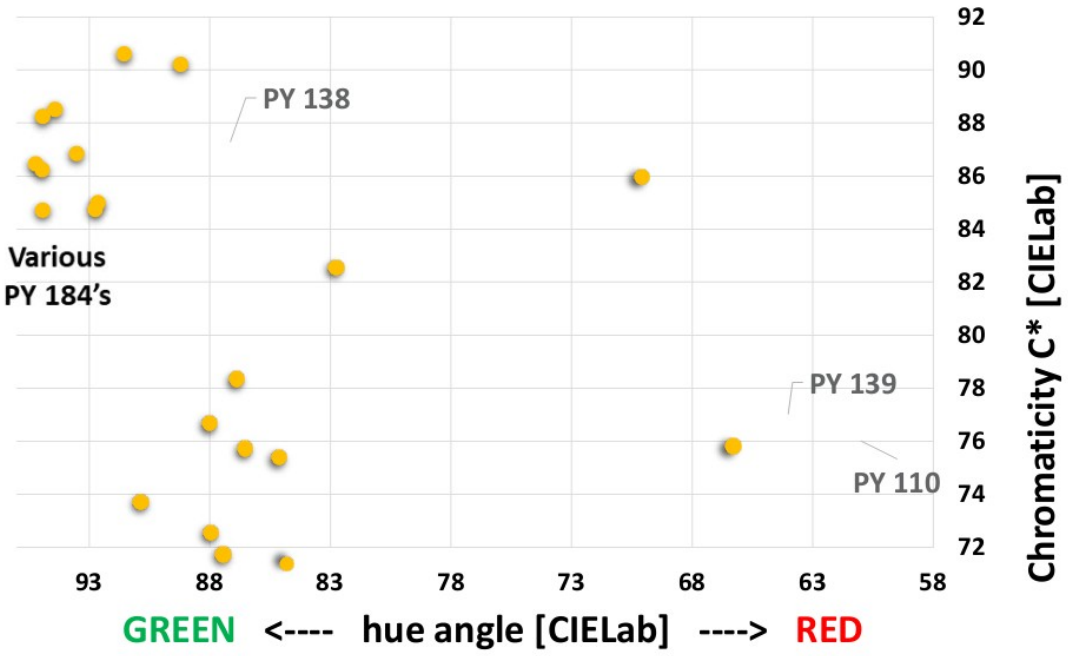
New generation BV developments also include a "stir in" type specifically designed for PP and PES fiber. It offers significantly better dispersibility as shown by the FPV test results below. The "stir in" type FPV compares very favorably at <1 bar/g. with other plastics grades being just under 3 bar/g and higher. The improved FPV yields higher quality products, fewer extruder screen pack changes, and increased throughput. These benefits do not come at the expense of durability or opacity as the "stir in" type maintains excellent ratings for both.



Polymer Compatibility Polyolefins

The range of BV's recommended for PO's exceeds that of ones that are recommended for other polymers. BV's predominately fall into the green shade yellow/lemon yellow color space; however, their high chromaticity allows them to maintain a bright hue when shaded with other pigments. Bismuth Vanadate's offer excellent fastness to migration, do not warp, and have some of the best UV properties you will find in yellow pigments. Their UV stability is excellent in both full shade and tint. They offer very good heat stability ranging from 260°C to 300°C. The combined properties allow BV to be used in some of the most demanding yellow plastics applications requiring excellent weatherfastness, heat stability, and no warpage. BV's also have very good color strength compared to other green shade yellow pigments that offer similar performance. It should also be noted that the color strength of BV's that can be used in PO's can vary by 40% or more. Their outstanding hiding power makes them a good alternative to green shade lead chromates and cadmium sulphide based pigments. Their low oil aborption also allows for more formulating latitude when being used in liquid color.

Using pigment yellow 138 as a reference organic pigment comparison for the green shade yellow color space. Bismuth Vanadate has similar or better heat stability, weathering is better in full shade/much better in tint, lower warping, and approximately half the color strength. When comparing color strength price per lb. should also be considered and BV is about half the cost. PY-138 also has FDA approval and Bismuth Vanadate does not.



Conclusions

Bismuth Vanadate Pigment Yellow 184 has been available for nearly thirty five years as a colorant for coatings and plastics. It was first recognized as a clean bright yellow with excellent exterior durability. The acceptance and usage in coatings has been much greater and faster than it has been in plastics. Part of the reason they did not experience the same rate of acceptance and growth in plastics was in part due some technical limitations in meeting plastics processing requirements. Since their inception BV's have experienced two or even three generations of modifications makeing them better suited for plastics. The primary improvements have been with heat stability, resin compatibility, enhanced chromaticity, and improved color strength. All being key attributes when selecting pigments for plastics. It is important to know and understand that there are many pigment yellow 184's available in the market place and even more important to know that not all pigment yellow 184's are the same. They differ in shade, heat stability, color strength, dispersibility, and resin compatibilty. It can be very helpful in knowing and understanding the various BV's available when searching for a high performance yellow for plastics. Bismuth vanadate may not only be a good choice, but the best option.

Acknowledgements

I would like to thank Bruce Howie PhD, Global Product Marketing Manager, DCL Corporation – Harry Hamers PhD, Technical Service Manager DCL Corporation, and Cristina Zanzottera PhD, former Product Manager at DCC for their assistance in writing this paper.

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Contact
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SPE COLOR & APPEARANCE

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