

Color and Appearance of Thermoset Composite Materials

Whole system approach maximizes performance of pigment dispersions



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Color matching and total appearance of thermoset composites can be a tough puzzle to figure out. The sheer nature of composites is at the root of the problem with the material's multiple formulation ingredients, complex processing, interacting chemistries and dynamic application environments.

However, optimizing the color and appearance of thermoset composite materials doesn't have to be as difficult as we make it out to be. By employing a total system approach, it is possible to maximize the physical performance of composite structures and still have a nicely pigmented finish.

Careful consideration of the observer and the materials that make up the composite material is essential in assuring the maximization of pigment dispersions.

The Observer

While the modern world has produced many sophisticated color measuring instruments, it is worth remembering that the human eye should always be the final and most important instrument used in evaluating color.

In fact, the human eye can discriminate between five and ten million colors when viewing objects side by side under identical conditions of light source, light intensity, angular size of the light source, angle of incidence of the light source and the background.

A big challenge that is presented by the human eye factor is that no two observers will see the object the same. To solve this problem, the colorist must take an average from several different observers to match or control color.

The Object

The object being observed comes with its own set of challenges because of its varying physical properties. The term "composites" can refer to materials that are closed- or open-molded, cast or pultruded, etc., so not only do the ingredients change, but so do the methods for optimizing appearance.

Here are the basics: Light penetrates the surface of an object where it is modified by

selective absorption, reflection and scattering by not only the colorants, but also by polymers, additives, fillers, glass and any object that has an index of refraction that is different from the surrounding matrix.

Pigments act on the incident light by absorbing wavelengths of electromagnetic energy within the visible region. The particular wavelength absorbed is determined by the chemical bonds within the color structure – for instance, a red pigment absorbs blue and green wavelengths, therefore red wavelengths are reflected.

The components of a composite can also contribute to “light scattering,” which happens when light contacts particles or regions with refractive indexes different from that of the primary polymer. If scattering occurs equally at all wavelengths with no absorption, the object will appear light or washed out.

The colorist can account for all color contributions to the matrix to provide a blend of pigments that, when used at the recommended loading, will produce the desired color.

In Conclusion

Color and appearance science has gained utilization in the modern composites industry as a standard practice. As the application of this science for quantification of appearance differences becomes more common – it is a natural progression to begin to better understand how to measure and control the variable affecting color.

This new systematic use of the whole system approach to composite color and appearance issues has the potential to enable composites to be used in new, higher performance applications.

Plasticolors’ Customer Service Welcomes Rising Star



John McLaughlin

Plasticolors is happy to announce the promotion of John McLaughlin to customer service representative. John may be new to this position, but he has served Plasticolors for three years in the packaging department and as a blending operator.

John’s father was in the Navy, so he did a lot of traveling as a child. He was born in Corpus Christie, Texas, and then lived in Japan, Maryland and Florida before finally landing in Ohio, where he has lived ever since.

Today, John is the father of an 18 month old daughter, Talia, and has been married to his wife, Shonene, for three years. Outside of work, he likes nothing better than spending time with his family and occasionally finds himself on the golf course in the summer.

In his new position, John is responsible for order entry and customer support. What does he like about working for Plasticolors? “The best part of my job is the people. I have made some good friends and really enjoy coming to work every day. This is a great place to work because Plasticolors offers flexibility and truly values hard work,” he said.,

Congratulations to John on his recent promotion!

Did You Know? Plasticolors Goes Paperless

New Digital Brochure Offers Easy-to-Access Information

Plasticolors recently announced the availability of its new digital brochure. Available on CD-ROM, the digital brochure enables easy navigation through Plasticolors’ products, capabilities and services, as well as links to the company’s Web site.

“As our society is becoming more and more paperless, we wanted to give our customers another way to view our products and services – without going online or sifting through filing cabinets,” said Brian Czuchra, technical marketing specialist for Plasticolors. “Our digital brochure provides customers with convenient access to detailed product information, so it can be a valuable reference when they are faced with colorant and dispersion challenges.”



Digital Brochure on CD

Patterned after Plasticolors’ recently unveiled Web site (www.plasticolors.com), this colorful digital brochure (**on CD, pictured above**) contains detailed information on standard products and custom capabilities for both the thermoset plastics and paint and coatings industries. The digital brochure is also linked directly to the company’s Web site, so if a customer would like to “Ask the Chemist” a question or find additional information on a product or service, he or she can be transported seamlessly to the site.

Visit www.plasticolors.com or call 440.997.5137 to order your digital brochure

today.

Ask the Chemist

If you are faced with a color conundrum, just ask the chemist!

Stop Being Flustered by Floating or Flooding Floors!

Question:

Epoxy floors are commonly installed in sections. Frequently, the seams between adjacent sections produce dark lines. Lines can also form when a floor surface is smoothed with a tool; this is especially true in grey floors. What causes this and what can be done to fix this problem?

Answer:

The problem is probably related to “flooding.” Flooding is a common coatings defect seen mostly in moderate- to high-film build coatings and systems that have a low viscosity for an extended period of time. The phenomenon of flooding is closely related to, and often confused with “floating.” In general these terms are frequently used together, and often interchangeably – however, there is a difference.

In both cases (flooding and floating), there is a separation of pigments within the wet film. In the case of floating, the separation tends to be horizontal and the result is that one pigment or filler (typically the least dense) tends to float just below the surface of the film, while the other pigments and fillers (typically more dense) are found near the bottom. Often, this problem is exacerbated by coatings that have an extended “workable” time, where viscosity remains low enough for the pigments to migrate easily and – if left open for a long enough time – the coating will eventually appear to have a uniform surface, but in the wrong color.

One common test to check for this phenomenon is a rub-up test. This can be done very easily by applying the coating at the target film build and allowing it to set for a few minutes, then, before the film thickens and cures, rub (using a gloved finger) a small circle in the coating and observe any changes in color between the “rubbed-up” area and the rest of the draw down.

In the case of flooding, the separation tends to be vertical in nature. In this case, there will be regions of high concentration of one pigment type separated by regions of higher concentrations of the other pigment type. The problem is typically identified by the appearance of lines or streams of one color within pools of another color. This effect is often seen where one pigment concentrates itself or “floods” the area around the perimeter (as in the case described in the question), or areas where a difference in shear exists (trowel lines). While similar to flooding, this is a distinct problem with a different mechanism.

To address this problem in epoxy coating applications, Plasticolors engineered the

EDC “ND” line of pigment dispersions. EDC “ND” masstones and blends are formulated using Bis-A epoxy resin and finely ground pigments—just like our ED line—but utilize the latest pigment dispersion chemistry to keep pigments uniformly suspended and dispersed in the coating – minimizing or eliminating pigment separation and color uniformity problems like flooding and floating. Often, these diluent-free, 100 percent solids EDC “ND” materials are the ideal solution for epoxy flood and float problems.

Ask the Chemist at www.plasticolors.com.

Success in Safety

At Plasticolors, safety is spelled B-I-N-G-O. While safety is a serious business, the company decided to have a little fun when it implemented “Safety Bingo,” where every day without an OSHA recordable injury means a new number is called. Just like in your grandmother’s version, once you’ve covered a full line a cash prize is awarded – except at Plasticolors everyone gets a prize.

Bingo is just one way Plasticolors is promoting safety. As of January, the company started a new incentive program where employees receive a bonus for every quarter without an OSHA recordable incident.

“Safety is truly a team effort,” said Ed Trenn, regulatory affairs and quality systems manager for Plasticolors. “The commitment of each and every person has resulted in about four and a half years without a lost-time injury. And, we’d like to keep up the good work.”

Plasticolors has committed time and resources into building a world-class safety program. In fact, the company was awarded Merit status of the OSHA Voluntary Production Program (VPP) in 2004 – which means it is on track to achieve Star status within the next three years. Star facilities comply with all VPP requirements, have less injury or illness rates than their industry’s average, and become a role model for other facilities in the same industry.

In addition, Plasticolors also was recently recertified to ISO 9001:2000, ISO T/S 16949:2002 and ISO 14001:2004 standards.