

Colored Mood Enhancers

Trend Report on the Coloration of Plastics

The circular economy, electromobility and the continuing corona pandemic are influencing color selection for plastics. **Kunststoffe** asked colorant manufacturers about the resulting color trends. We also wanted to know what effects the increased use of recyclates is having and the extent to which manufacturers are affected by the present supply bottlenecks.



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Color trends frequently follow current events and react to social developments and needs. That is why plastics colorant manufacturers predicted last year that the Covid 19 pandemic would have a significant influence on future color trends. Since the crisis is still with us, manufacturers are continuing to assume that color selection for plastics products will be influenced by the pandemic. Unlike last year, however, they expect the end of the pandemic to be a particularly

decisive factor. "After a difficult year full of challenges, we are seeing color trends that reflect regained freedom," explains Andreas Buder, Technical Marketing Manager Plastics at Clariant. According to him, strong yellow shades are particularly in demand. This is confirmed by Dany Ludwig, Head of Product Management for Color & Functional Masterbatches at Grafe Advanced Polymers. He sees colors coming, such as yellow and warm orange, that express optimism and a posi-

tive attitude after what has been a stressful year for many people.

For Ludwig, the pandemic also creates a desire for shades that remind us of nature. "The Corona crisis intensifies thoughts of nature, sustainability and fully conscious living. Natural, friendly shades and warm colors will be increasingly sought," he explains. One trend will continue from last year: back in 2020, colorant manufacturers predicted that because of the pandemic there would



Danny Ludwig, Grafe Advanced Polymers: "Scarcity of raw materials will remain a key issue in material supply, which is why alternative sources are needed. This also includes the circular economy." © Manfred Fischer, Grafe

be increased demand for natural shades such as green and brown. This trend will also intensify because of the continuing strong interest of many customers in more sustainable products. "To represent sustainability and the circular economy in color terms, green shades are an obvious and symbolically apt choice," maintains Andreas Buder from Clariant.

Added Value with Black

Black also remains an ever-popular color that is always in trend, according to Buder, albeit for changing applications. Dr. Christof Kujat, Head of Global Technical Industry Management for Plastics at BASF Colors & Effects, reports that this is currently the case in the automotive industry. "In the automotive industry, deep black shades continue to be in high demand," he says. The unwaning interest in black is also to do with the fact that for most manufacturers a number of alternatives to carbon black are now available. Black plastics are frequently colored with carbon black. Carbon black, however, absorbs a large proportion of near-infrared light (NIR). Many sorting systems in recycling plants depend on NIR sensors and cannot therefore separate carbon black-colored plastics into the different polymer classes. This makes it difficult to recycle black plastics waste. As an alternative, many manufacturers have now developed NIR-compatible black pigments.

Pigments not absorbing NIR radiation do not just play a role in recycling but

offer an additional benefit. "In the construction sector, the long-term trend towards dark gray and anthracite shades continues, e.g. for dark window frames. Here, as an alternative to carbon black, there is a demand for functional pigments that produce dark shades but at the same time do not absorb in the NIR range and so reduce heating up of parts due to sunlight," explains Kujat. According to him, this is relevant not just for buildings but also for cars, particularly electric vehicles. In these, NIR-reflecting plastics help reduce heating due to sunlight and so aid, for example, heat management of electronic components. These colorants are also playing a greater role in production, according to Kujat, for example in laser transmission welding. They allow black coloration of engineering plastics in NIR-transparent top layers.

Besides black, the growing use of recyclates has also had effects on other color products. Not only the plastics themselves but also the colorants used need to withstand several recycling cycles without color quality being compromised. "The purity of the pigments used is becoming a crucial factor, since the color must withstand several recycling and extrusion cycles. These repeated heating cycles can damage the pigments. Therefore, it is extremely important for masterbatch and branded-article manufacturers to ensure the use of high-purity pigments," explains Andreas Buder from Clariant. Plastics processors should therefore keep in mind not only coloration of the present product but also the use of the material after recycling.

When using plastic recyclates, their original color poses a problem for the next coloration process. "Coloration is dependent on the intrinsic color of the base material. The lighter and more uniform the intrinsic color, the more versatile the material in terms of use," explains Dirk Schmitz, Head of Coloristic in the High Performance Materials Division of Lanxess. However, in many cases these advantages are reflected in the price of the plastic recyclates. Light-colored, transparent recyclates tend to be more expensive than a dark polymer fraction.

So far it has also been difficult to achieve uniform quality and color with recyclates. This must be taken into account in their coloration. "Recyclates are usually of unknown composition and varying in-



Andreas Buder, Clariant: "The color must withstand several recycling cycles. Therefore, it is extremely important for masterbatch and branded-article manufacturers to ensure the use of high-purity pigments." © Clariant

trinsic color. Consequently, very efficient, opaque, strong pigments are needed, which at the same time must meet temperature and process stability requirements in the desired polymer," explains Christof Kujat from BASF. To achieve the desired color, according to Danny Ludwig from Grafe, a large quantity of colorant is also required. The yellowing of plastics that typically occurs with repeated recycling cycles can be corrected by the addition of specifically adjusted colorants. To determine with which colorant in what quantity the desired end product color can be achieved, Clariant has developed a software tool. With this color matching software, according to Andreas Buder, strong shades can be obtained, even with relatively high recycle content.

Danny Ludwig from Grafe sees an interesting trend in the coloration of recyclates. Recyclates are no longer deemed inferior but considered rather to be a quality and sales criterion. Ultimately, they show that the manufacturers are aware of their responsibility for the environment. According to Ludwig, if the use of recyclates is evident at first sight,



Dr. Christof Kujat, BASF Colors & Effects: "In the construction sector, there is a demand for alternative pigments to carbon black that do not absorb in the NIR range and so reduce heating up of parts due to sunlight." © BASF

this now pays dividends with customers. Brand-name manufacturers must bear this in mind in product design and color selection for their products.

Use of Pigments to Compensate for Shortcomings in Recyclates

Besides possessing an intrinsic color, recyclates also frequently have reduced mechanical and processing properties and a distinctive odor. These problems can be partly solved by coloration with pigments that also improve these properties. For example, BASF offers pigments such as Eupolen PE Blue 69-1501, Eupolen Green 87-35-01, and Irgazin Red K 3840 LW that can have a positive effect on the warpage behavior of recyclates. Another possibility is the use of additives that bring mechanical or processing properties up to the required level or neutralize odors. Dirk Schöning, Divisional Sales Manager at AF-Color, notes that companies are now showing great interest in these topics: "We offer solutions for restoring certain mechanical strength characteristics. But we also frequently discuss with our customers how to deal with processing problems such as the absorption of odors in processing recyclates."

Another trending topic in the plastics industry at present is electromobility. A color closely linked with this sector is orange. This has become established for high-voltage components in electric vehicles. The burgeoning sales of electric cars



Dirk Schmitz, Lanxess: "The coloration of recyclates is dependent on the intrinsic color of the base material. The lighter and more uniform the intrinsic color, the more versatile the material in terms of use." © Lanxess

are ensuring increased demand for orange pigments, with further growth potential: "In our view, the use of orange in electromobility is a trend that is just starting to gather momentum. It will undoubtedly accelerate in the coming years," confirms Dr. Lars May, Head of Application Technology Screen and Plastics at Lanxess.

Besides the trending topics of sustainability, recycling, and electromobility, the current supply bottlenecks for raw materials are also concerning colorant manufacturers. For some months now, they have been faced with significant price rises and delivery delays for many plastics. According to Christof Kujat from BASF, this is also the case for some additives such as colorants. The reasons for the bottlenecks include the diversion of raw material supplies to Asia because the industries there have emerged more quickly from the Corona pandemic, as well as fully booked transport capacities for sea and air freight containers. "We masterbatch manufacturers are particularly affected by the shortages because we support a very flexible business with frequently changing requirements. The quantities are often small. In addition, the



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business covers a wide range of polymer types, additives, and different colorants. At the present time, the difficult supply situation is impacting quite considerably on our ability to meet our customers' requested delivery dates. Of course, that doesn't satisfy anyone on either side," observes Dirk Schöning from AF-Color. Dirk Schmitz from Lanxess takes a somewhat more positive view: "Thanks to our solid, long-established customer base and continual demand analyses, we have succeeded with our customers in developing a good forecast so we can cushion supply fluctuations."

Danny Ludwig from Grafe expects the present situation not to be just a one-off. Because of globally increasing resource consumption, companies must in future adapt to more frequently occurring raw material bottlenecks. But Ludwig also provides a possible solution to this: "Scarcity of raw materials will remain a key issue in material supply. The challenge lies in developing alternative sources. This will also mean returning plastics back into the cycle and finding innovative recycling solutions." ■

Florian Streifinger, editor

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The Colorful World of Plastics.

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