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to appeal to a very specific audience, namely consumers in the high-growth personal care products market in Asia. The experts have carefully chosen a limited palette of three on-trend colours to combine with a satin brushed-glass effect to give polyethylene terephthalate (PET) packaging a luxurious ‘high-end’ look. Elsewhere, Clariant’s Additives business is collaborating with Floreon-Transforming Packaging with the aim of boosting the performance and market potential of polylactic acid-based biopolymers.

According to Clariant, combining the satin special effect with the three colours selected from its ColorForward® 2021 trend palette [ADPO, March–April 2020, pp. 5–6] gives stretch blow-moulded PET packaging a feel of ‘luxury and prestige’ normally associated with brushed glass containers used for high-end branded products. While the satin effect technology is not new in itself – with Clariant among the early introducers of the technology nearly 15 years ago – its combination with ColorForward colours with the express intention of targeting a very specific audience is a new approach, according to designer Vick Cai at Clariant ColorWorks™ Asia-Pacific. ‘In this project, we focused on colours for the Asian personal care market, but we could do the same thing for any category in any region’, Cai says.

The satin effect can be used with any colour, or without colour, but the team at Clariant ColorWorks' Italy and Singapore centres decided to focus on hues that are most likely to appeal to the target audience. Cai reports that the team researched the Asian skin care market, especially in Japan and Korea which produce many of the most popular brands, and found ‘a definite preference’ for soft, muted colours and those that are found in nature. As a result, they chose three colours introduced in the ColorForward 2021 edition of the company’s annual colour forecasting guide for plastics. No W1-F1 is a soft green suggesting ‘healthy, natural products’, preservative-free and less likely to cause skin irritation; Motus intelligentia is a ‘very natural’ pinkish coral, a warm tone which in Asian culture is associated with youthfulness and the fight against aging; and translucent beige The golden ticket contains subtle gold flecks that create a feeling of luxury and indulgence, according to Clariant. Adding the satin look creates a visual illusion of depth within the container walls, making the bottle ‘appear more like glass’, while also giving the bottle a ‘softer surface feel’ so it is more pleasurable to hold, further heightening ‘the impression of luxury’, Cai claims.

The satin look is achieved by adding a proprietary additive in concentrated masterbatch form to natural PET resin during the initial moulding of a bottle preform. The satin effect develops during the stretch blow-moulding process as the preform is reheated, stretched and blown into the finished shape, Clariant explains.

In other company news, Clariant’s Additives business and Floreon-Transforming Packaging, a specialist in PLA-based compounds containing 70–90% renewable plant-based raw materials, are joining forces with the aim of developing enhanced grades to target new market sectors, while preserving PLA’s environmental benefits. By combining Clariant’s additives with Floreon’s proprietary material solutions, the partners aspire to make PLA-based biopolymers a credible, low carbon footprint alternative to conventional, petrochemically-derived polymers in a range of additional single-use and durable applications. Target markets for the new, enhanced grades include rigid and flexible packaging, automotive, electrical and electronic equipment, hygiene products and consumer goods.

Floreon’s existing grades are reported to be mechanically tougher than traditional PLA and can deliver significant energy savings in processing. They are also recyclable and are suitable for industrial composting. Incorporating Clariant additives such as stabilizers, flame retardants, processing aids and surface aids into these compounds should allow ‘bespoke property extension’ for specific industry and application needs, according to the partners. In particular, Clariant will contribute bio-based additives from its Exolit OP Terra, Licocene Terra and Licocare RBW ranges [ibid., December 2019, pp. 4–5] to help Floreon improve the performance and processing characteristics of its materials. ‘Examples include achieving less energy use and faster cycle times by increasing the processing efficiency or adding completely new properties to the material’, Clariant says. According to Floreon’s CEO Shaun Chatterton, the company expected to launch the first product from the collaboration onto the market during the first half of 2020.

More information: www.clariant.com/colorworks
More information: www.clariant.com/additives
More information: www.floreon.com

NECOC project aims to convert ambient CO₂ to industrially relevant carbon black

At Germany’s Karlsruhe Institute of Technology (KIT), the NECOC research
Additives for Polymers

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MATERIALS

project involving KIT spinoff Ineratec GmbH and Climeworks, a spinoff of ETH Zurich, aims to build a container-scale test facility to convert atmospheric carbon dioxide (CO₂) into highly pure carbon black suitable for use as a resource in industry. Scheduled to run for three years, the project is funded to the tune of €1.5 million by the German Federal Ministry for Economic Affairs and Energy (BMWi).

In order to meet the target agreed at the Paris climate agreement of 2015 to limit global warming to below 2°C by the end of the century, worldwide efforts to reduce greenhouse gas emissions must be complemented by solutions to remove the emitted CO₂ already present in the atmosphere. The test facility being set up within the NECOC project will capture CO₂ from ambient air – returning CO₂-free air to the atmosphere – and then convert the captured gas via methanation and pyrolysis steps to pure carbon in powder form. ‘In this way, a hazardous greenhouse gas will be converted into a raw material for high-tech applications’, explains Professor Thomas Wetzel of KIT’s Institute of Thermal Process Engineering (TVT) and Head of the KALLA Karlsruhe Liquid Metal Laboratory of the Institute for Thermal Energy Technology and Safety. Carbon black has a number of well-established industrial applications.

The ambient CO₂ is captured by means of an adsorber and then combined with renewable hydrogen to produce methane and water in a microstructured reactor. The water becomes the source of the renewable hydrogen (via electrolysis) and the methane serves as the carbon carrier into the downstream process. The methane is passed into a bubble reactor filled with liquid tin. A pyrolysis reaction takes place within the ascending gas bubbles, decomposing the methane into its constituents – hydrogen, which is directly fed back to methanation, and solid carbon in the form of microgranular powder, namely carbon black.

All process steps have already been studied and developed up to the laboratory scale by the researchers involved but their realization together in an integrated facility is a world first, reports NECOC’s project coordinator Dr Benjamin Dietrich of TVT. ‘Skilful integration of the process modules and correct process conduct will be decisive for the energy efficiency of the process and the quality of the carbon black product’, he comments. The major advantage of the NECOC process over previously proposed concepts to reduce atmospheric CO₂, such as carbon capture and storage methods (CCS) to store CO₂ in deep rock layers, is embodied in this end product, Dietrich explains. Solid carbon is far less difficult to handle than CO₂ and can even be used as a resource, providing an alternative to carbon black produced from fossil petroleum, he says. ‘That is why our process represents a technological approach for a sustainable future in several respects. It combines the direct contribution to solving the climate problem with a process for post-fossil resource supply’, Dietrich concludes.

In another carbon black-based collaboration, tyre-making giant Michelin plans to form a strategic partnership with Swedish start-up Scandinavian Enviro Systems to develop and industrialize pyrolysis technology to recycle end-of-life tyres. Founded in 2001, Enviro has developed an innovative technology to modify the chemical composition and physical phase of the tyres during the pyrolysis process, while ensuring minimal energy consumption. The technology allows the recovery and re-use of high-quality carbon black and pyrolysis oil, among other products, effectively turning waste tyres into a source of useful raw materials. Recycling is a major issue for the global tyre industry and its customers, with around 1 billion tyres reaching the end of their life every year.

The two companies have signed a letter of intent regarding a strategic partnership and Michelin has taken a 20% stake in the Swedish firm via a directed share issue. The partnership is expected to further comprise a development agreement to deploy Enviro’s pyrolysis technology on a larger scale, a shared project to construct a plant to industrialize the technology, and a joint supply agreement. Originally, the two companies had expected to conclude negotiations by mid-2020 but the coronavirus pandemic has slowed proceedings and they now hope to reach a final agreement by the end of this October. Following its acquisition of Lehigh Technologies in 2017 [ADPO, December 2017, pp. 8–9], Michelin says its intended partnership with Enviro is further evidence of its long-term commitment to recycling and sustainable mobility.

More information: www.ineratec.de and www.kit.edu
More information: www.envirosystems.se and www.michelin.com