Down to the Smallest Detail

Pushing Material Properties to the Limit, Combining Materials, and Finding Alternative Raw Materials

Plastic compounds are becoming increasingly specialized and have to offer more and more functions simultaneously. Not only are the requirements regarding to technical characteristics getting stricter. Sustainability is steadily coming into focus as well, with bio-based or recycled material versions.

Increasing specialization is reflected by materials with properties aligned as closely as possible with specific applications, tailored to the subsequent product down to the details. Thus, the development towards tailor-made characteristic profiles for additives and compounds continues. Providing the maximum number of functions with a single compound continues to be the goal. At the same time, straightforward processing still has to be possible for economical and therefore sustainable production. However, the sustainability trend continues to be clearly discernible in the increased offering of bioplastics as well. Surely this is where the greatest innovation potential lies.

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Akro-Plastic

Replacement for Scarce PA66

Due to the increasing shortfall in the supply of PA66, Akro-Plastic GmbH, Niederzissen, Germany, has developed a PA6 with the trade name Akromid B+ in view of PA66 substitution. Reinforced with 50 % glass fiber, this compound – conditioned and at 80 °C – reaches the same strengths as conditioned PA66-GF50 according to the manufacturer. The stiffness of this conditioned material is said to be nearly at the level of PA66, with pricing in the range between PA66 and PA6.

Fig. 1. Metal tears, hybrid holds: The high adhesion between metal and plastic leads to a fracture in the aluminum (© Akro-Plastic)

A polyamide compound with the designation Akromid PST has been developed in cooperation with Plasmatreat GmbH, Steinhagen, Germany. It is particularly well suited for plastic-metal hybrids. Tensile/shear strengths considerably above 50 MPa can be achieved in combination with stainless steel, as shown in **Figure 1**.

Fig. 2. Cooling water pipe made of a PA66+PP blend (© Akro-Plastic)

The compounder has developed a new material, Akromid A3 GF30 4 L black (4678), as an alternative to hydrolysis-stabilized polyamide. The blend of PA66 and PP offers very good hydrolysis resistance that permits applications in cooling water systems (**Fig. 2**). Here the proportion of PA66 has been considerably reduced, and the material has a low density that results in an added weight advantage.

The M-Vera compounds with a correspondingly high proportion of renewable raw materials (bio-based carbon content over 40 %) and variable end-of-life scenarios expand the overall offering in the direction of bioplastics.

- **Hall B2, booth 2209**

FKuR

Bioplastics are Becoming More Diverse

A high dimensional stability under heat and biodegradability are promised by a new compound based on polylactic acid (PLA) from FKuR Kunststoff GmbH, Willich, Germany, with the type designation Bio-Flex S7514. It was developed especially for injection molding applications. Thanks to very good flowability, the compound can also be used in multi-cavity molds and makes complete mold filling possible, even in case of long flow paths. The compound itself is 75 % bio-based. With the combination of high dimensional stability under heat and high flowability, it is predestined for use in products like those in **Figure 3**. The desired color can also be obtained using a masterbatch.

Fig. 3. PLA compounds are frequently found in catering applications such as cutlery (© FKuR)

Thermoplastic elastomers (TPE) under the trade name Terraprene are 40 % to 90 % bio-based. In addition to mechanical properties equivalent to those of fossil-based TPE, they can be processed using conventional injection molding, 2-component injection molding, and extrusion processes. A polypropylene with a bio-based carbon content of about 35 %, available under the trade name Teralene, can also be processed using these methods. It can be used as a drop-in thanks to the properties and processability corresponding to conventional PP.

↘ **Hall B4, booth 4404 and hall A5, booth 5211**

Barlog Plastics

Low-Emission POM for Interior Applications

Barlog Plastics GmbH, Overath, Germany, announced a special low-emission material for applications on the vehicle interior. In addition to the familiar technical properties of POM, the polyoxymethylene (POM) line Kebaform XFA offers a considerable formaldehyde reduction, thereby meeting the requirements of the automobile industry (**Fig. 4**). Whether natural, colored, or under unfavorable processing conditions: The formaldehyde emission value, for example according to VDA 275, is less than 2.0 ppm.

Fig. 4. POM with low formaldehyde emissions for the vehicle interior (© Barlog)

↘ **Hall A3, booth 3209**

Eckart

Shiny Gems

Intense, high-chromaticity color, stable and uncomplicated processing: With the additive Edelstein Topaz Orange, Eckart GmbH, Hartenstein, Germany, is expanding its portfolio introduced to the market in 2017 with an additional, powerful, trendy color. The intensely colored, synthetic pearlescent pigment produces dazzling orange shades. Based on a patented coating technology for sheet silicates, the pigment exhibits a high brilliance, color purity, and color strength. It can be processed using all conventional methods and makes visual effects possible for cosmetics, sporting goods, and lifestyle products.

Mastersafe Symic is a dust-free pigment preparation in pellet form (**Fig. 5**). Selling points of the dedusted pearlescent pigments include straightforward dosing and easy handling. The pellets permit the dust-free production of color masterbatches and are suitable for various processing methods. These include injection molding, extrusion and extrusion blow molding, blown film extrusion, and flat sheet film extrusion. Fields of application not only cover automobile components, household articles, and electric appliances, but also packaging for cosmetics and foodstuffs since the pellets are approved for food contact.

Fig. 5. Dust-free handling of Mastersafe Symic pearlescent pigments is assured due to their pellet form (© Eckart)

↘ **Hall B2, booth 2208**

Cabot

Efficient Black

Cabot Switzerland GmbH, Schaffhausen, Switzerland, is expanding its portfolio in the area of electrically conductive plastics. Various compounds with different formulations are intended to offer the greatest possible flexibility for processors.

This applies correspondingly to a black masterbatch, which only uses a small proportion of carbon black and thereby minimizes the detrimental effect on the mechanical properties. Very high color strengths for styrenes and polyamides can nevertheless be realized with the help of these masterbatches. The masterbatch offering is also being expanded with recycling-based materials in order to improve the sustainability of the materials used.

↘ **Hall B5, booth 5206**

Habich Farben

Colors in All Forms of Preparation

The new Sunset Beach, Summer Flower, and Deep Ocean color collections from G.E. Habich's Söhne GmbH & Co. KG, Reinhardshagen, Germany, feature a summer color palette of refreshing hues. On the other hand, the interior trend collections Modern Boudior and Blue & Rust are offered with a soft-touch surface feel and marble effects. Hacoplast Bio masterbatches for use in biodegradable plastics are also being presented as part of the collection.

Habich Farben developed the Jewelry collection for color masterbatches with metal effects in granulate form in cooperation with Eckart GmbH. According to the manufacturer, they should give the appearance of a laquered surface. At Fakuma the collection can also be seen for the first time as Habisol effect liquid colorants. They are offered with an appropriate dosing system, which is being demonstrated live at the exhibition stand.

Hall B2, booth 2305

Kraiburg TPE

Diversity through Specialization

The new Thermolast K FG/SF product range from Kraiburg TPE GmbH & Co. KG, Waldkraiburg, Germany, aimed especially at the vehicle interior (**Fig. 6**) with strict requirements for surface characteristics, is versatile in application. All common automobile manufacturer standards regarding emissions, odor, and UV resistance are met. An extremely broad range of possible applications is therefore covered by compounds of the TPE family in the hardness range of 50 to 80 shore A, from floor mats and anti-skid mats to decorative surfaces to functional components. Color matching is possible in addition to the standard colors black and natural. The compounds are also highly abrasion-resistant and adhere reliably to polypropylene.

Very good adhesion to polyamide is exhibited by compounds of the Thermolast K FC/AD/PA series, available in a hardness range from 40 to 80 shore A. They are FDA-compliant and therefore suitable for applications with food or oral contact. Straightforward processing and ease of coloring support a high degree of individuality.

Fig. 6. Broad range of applications for thermoplastic elastomers in the vehicle interior
(© Kraiburg TPE)

Hall B5, booth 5303

Ökoplast/CKT

Sustainable Use of Resources

The NPC Nature Plastic compounds from CKT GmbH and Ökoplast GmbH, both: Mittweida, Germany, are suitable for various fields of application. Materials offered in this line are made of synthetic, bio-based, and/or biodegradable polymers filled with non-food raw materials from local agriculture such as rye bran or oat husks. Polyolefins, preferably polypropylene, are the main matrix materials. The compounds filled with natural substances exhibit a natural or near-natural look and feel. They are currently being used to make extrusion and injection molding parts for construction, gardening, household, and office applications (**Fig. 7**).

Fig. 7. Filled bioplastics that can be processed using conventional injection molding
(© Ökoplast)

Hall A5, booth 5228

Teknor Apex

Between Heat-Resistant- und Specialty-Polymers

A new series of high-heat glass-reinforced polyamide 66 compounds is presented by the Teknor Apex Company. Creamid 240 H7.5 series compounds provide the strength and stiffness of highly glass-filled engineering polymers while maintaining mechanical properties even after continuous service at temperatures of 240 °C. The compounds have processing temperatures in the range of 280 to 300 °C and resist mold temperatures of 80 to 110 °C. Currently available grades, with glass fiber content of 35, 50, or 60 %, exhibit improved property retention in comparison with similarly glass-filled standard PA66 compounds. At the same time they cost around 30 % less per kilogram than high-performance polymers such as polyphthalamide (PPA) or PA46, while providing comparable performance.

Hall B2, booth 2114

Ter Plastics

Defying the Heat

The Ter Plastics Polymer Group, Herten, Germany, is presenting technically mature ways to battle rising costs and the apparently high risks of supply chains, as in the case of PA66 and precursors. Extensive possibilities are offered in this regard by the Terez house brand with the PA6 Terez B, PA66+6 Terez AB, Terez Eco, and Terez LFT in the long fiber-reinforced version. Meanwhile the manufacturer's long-fiber compounds include the standard polyamides PA6, PA66, and PA66+6 as well as the high-performance polymers Terez GT2, GT3, and HT. The materials are suitable for applications under highly dynamic conditions in the temperature range from -40 °C to 180 °C.

An exclusive and patented process for the chemical linking of polytetrafluorethylene (PTFE) is offered for low-noise automotive applications. These Terez PTFE types are suitable for applications focusing on tribological properties with practically no wear. Chemical linking significantly reduces the abrasion or release of the PTFE molecules. The sliding-friction modification of the surface is permanently maintained.

Ter Plastics Polymer is expanding its portfolio in the high-temperature range, especially in the area of partly aromatic polyamides. The PPA product range was expanded with the products ForTii MX3T and ForTii Ace MX53T from DSM Engineering Plastics B. V. These materials are said to be considerably more robust compared to conventional PPA materials in a temperature range from -35 °C to 150 °C. They combine high stiffness and strength with simultaneous great toughness. The resistance to chemicals remains at a very high level for a high-performance polyamide and is similar to PEEK. Very good temperature resistance can also be achieved in blends with polyamides. Technyl Red J from Solvay S. A. with a patented PA66/6T technology exhibits a heat aging resistance of 2000 hours at 220 °C. This material, which can be processed further using vibration or hot gas welding, is particularly well suited for engine compartment applications, for example in turbocharger systems, air intake manifolds, and intercoolers.

In the interior of the automobile, the low-emission POM with the trade name Duracon LV from Polyplastics Co. Ltd. releases only minor traces of volatile organic compounds (VOCs). It was developed to meet the automobile industry's latest requirements, with formaldehyde emissions < 2 mg/kg measured in the VDA 275 test. Miniaturization and weight reduction in computers, photocopiers, and projectors leads to higher internal temperatures during use, which can increase the release of VOCs. Low emissions are therefore assured for use in office and electronics applications as well.

Hall B1, booth 1206

Thüringisches Institut für Textil- und Kunststoff-Forschung

As Powerful as a Magnet

The Thüringisches Institut für Textil- und Kunststoff-Forschung e. V. (TITK), Rudolstadt, Germany, has developed new compounds with magnetic properties. These can be installed as inductive components after processing. They can be used for example to replace previous magnetic circuits made of ferromagnetic materials in valve actuators, as shown in **Figure 8**. Metallic additives make it possible to produce plastics that are not possible with the polymer only. High magnetic flux densities can be achieved with magnetically soft components such as iron CIP and Fe(DRI) or iron alloys. This makes it possible to produce throw forces in valve actuators to hold the armature in a certain position. Permanent magnets can be produced using carbide-filled alloys such as neodymium iron boron, which can fix the armature in a specific switch position with no current. Notwithstanding the addition of metallic additives, the compounds can be processed using injection molding and therefore support a high degree of design freedom and a broad range of possible applications.

Fig. 8. Overmolded valves with integrated electronics in the fluid stage (© Professur für Fluid- Mechatronische Systemtechnik, TU Dresden)

TITK is also presenting a composite film for temperature-sensitive goods to be conveyed (**Fig. 9**). Insulin, for example, must be transported at an ambient temperature of 2 to 8 °C, otherwise it will lose its effect. The film stores thermal energy using a phase change material. A target temperature can therefore be set precisely in a range from - 4 to + 82 °C – a benefit for the shipment of plants, foodstuffs, pharmaceuticals, and much more. The shipping film is leak-proof and offers a variable surface design that can be adapted as desired. It is flexible in application as bubble wrap and can be cut to size or welded. A sheet version has also been tested, and composite and injection molding parts are possible as well.

Fig. 9. Project Manager Martin Geissenhöner of TITK in Rudolstadt displays two types of bubble wrap for transporting temperature-sensitive goods (© TITK/Steffen Beikirch)

The goal of the project subsidized by the German Federal Ministry for Economic Affairs and Energy was to develop a shipping film with characteristics that, alone or in combination with other temperature control measures, make it possible to realize the required transport temperatures throughout the entire transport period. The film material as an insert, overlay, underlay, or cover is compatible with all surfaces of known transportation and storage systems. In the future the film could also be equipped with additional functions, such as antibacterial properties or a reflective aluminum film.

Hall B3, booth 3201

K. D. Feddersen

Focus on the Automobile Interior and Exterior

The plastics distributor K. D. Feddersen GmbH & Co. KG, Hamburg, Germany, offers a large selection of materials for the automobile interior. Thanks to a special "soft touch" surface of the offered PP compound Softell, effects such as a leather grain including seam are said to be possible using a corresponding injection mold with no additional coating. The PP compound from LyondellBasell, Rotterdam, Netherlands, also exhibits good silencing, very good colorability, and simultaneous good weld strength and impact resistance. It can replace components that are painted or covered with a PVC skin, reducing the process costs.

Emissions have to be kept low on the vehicle interior in particular, which is given with the aforementioned PP compound. The low-emission formulation of the POM compound Hostaform XAP² from Celanese Corporation, Dallas, TX, USA, with formaldehyde emissions below 2 ppm according to VDA 275, also meets the requirements of the Asian and European automobile industry for interior applications. Similarly, the ABS High-Heat product range from Elix Polymers S. L., La Canonja, Spain, meets the requirements of European automobile manufacturers according to VDA 277 and VDA 278. Very low emission values are also exhibited by the PC+ABS blend Multilon from Teijin K. K., Chiyoda, Japan, which is suitable for applications in the vehicle interior. In addition to its mechanical and thermal properties, it exhibits good flowability, a high surface quality, and a pleasant surface feel, and is well suited for the coating process.

The products in the Galvano ABS series from Elix Polymers can be used for chrome-plated decorative components, both on the vehicle interior and exterior. Its very good electroplating adhesion leads to low scrap rates. A special quality control process was developed to ensure this. The flowability of the ABS has also been improved, along with high impact resistance, low emissions, and low odor. These materials that can be electroplated can also be used for high-end cosmetics packaging and for bathroom fittings.

Especially for the automobile exterior, the distributor offers UV-stabilized, mass-colored PP compounds under the trade name Hifax from LyondellBasell. Metal effect pigmentation replaces the coating, thereby reducing the density and cost. Combined with special processing methods such as water or gas injection technology, physical (e. g. MuCell) or chemical foaming, the density of these materials can in part be further reduced considerably. Weight reductions of 10 %, in extreme cases also up to 30 % or more, can be realized according to the manufacturer depending on the material and process.

The POM all-rounder Hostaform SlideX from Celanese is suitable for higher load limits and offers a longer service life for sliding friction applications. This material sets itself apart with a low friction coefficient and low wear rates in combination with many different plastics. Extensive studies revealed no noise development under load. According to the manufacturer's press release, no impairment whatsoever of the mechanical properties is expected – in contrast to conventional sliding friction formulations – due to the special tribology modification. The material is FDA-compliant and XAP² types in low-emission formulations (formaldehyde emission < 5 ppm) are available.

Hall B2, booth 2209

Polyvel

Expansion of the Application Range for Polyolefins

The modern polymer processing industry would be unthinkable without peroxides as highly reactive chemicals. Mixing them with recycled polyethylene reduces the melt flow index to obtain the desired low-viscosity flow characteristics for film extrusion, blow molding, and extrusion blow molding. This applies correspondingly for polypropylene and ethylene-vinyl acetate copolymers. Peroxides and the common peroxide concentrates usually come in the form of powders or liquids, so that storage and dosing in particular are highly critical. What's more, peroxides in this form are highly reactive, so they volatilize quickly and form inflammable organic compounds.

Polyvel Europe GmbH, Hamburg, Germany, has developed peroxide masterbatches, some of which are also approved for food packaging applications. Here the peroxide itself is entirely surrounded by a polymer carrier material, protecting it against external influences and making it fully storable with no special requirements. Precise and constant dosing during processing is also made possible by the granulate form (**Fig. 10**). Properties such as the melt flow index are precisely controlled to obtain the desired flowability regardless of the base material.

Fig. 10. The masterbatches are colorless, ISO 9001:2008-certified and readily mixable with all PE grades common in the market. The peroxide masterbatch has a shelf life of several years (© Polyvel Europe)

Hall B4, booth 4502

Conclusion

The trend in favor of multifunctional, application-specific materials continues, and is reflected in particular by the variety of compounds that are tailored to customer requirements. The sustainable choice of materials keeps gaining importance.