

TRINSEO TPE SOLUTIONS

Tailor-made Plastic Materials for Flexible Applications



Synergy Advantages for All End Markets

Trinseo is a leading global materials solutions provider and a manufacturer of plastics, latex binders, and synthetic rubber. With the acquisition of Applicazioni Plastiche Industriali S.p.A. (API) in 2017, Trinseo has expanded the plastics products portfolio. Our customers can now benefit from the sustainability of a global material solution provider combined with the flexibility of a family-owned company.

You particularly know Trinseo's Plastics segment offering a complete range of styrenic polymers, including Polystyrene (PS), Acrylonitrile Butadiene Styrene (ABS) resins, Styrene Acrylonitrile (SAN) resins, as well as Polycarbonate (PC) resins, blends and compounds.

In addition to our rigid plastics portfolio, we can offer a wide range of tailor-made thermoplastic elastomeric-based compounds. This soft-touch plastics portfolio includes TPU-, TPS, TPO, TPC, TPV, TPZ, OBC - and EVA-based compounds, partly also available as innovative bioplastics versions including advanced biodegradable and/or bio-based compounds.

Our plant in Mussolente, Italy, is equipped with state-of-the-art technology and production processes. Our technical team conducts research and development using on-site testing facilities and research labs. With a joint portfolio of rigid and soft-touch plastics we can provide flexible solutions to meet an even broader range of customer needs.

Soft-touch Plastics Product Portfolio

Trinseo's thermoplastic elastomers (TPE) – suitable for a wide range of applications in all common markets- are polymers or polymeric compounds which possess both thermoplastic and elastomeric properties at working temperatures.

TPEs provide the elasticity and look and feel of rubber in combination with an easier processability and significant cost advantage. In addition, the recycling and reuse of TPE materials is less complex as compared with rubber products.

Styrenic block copolymers (TPS)

MEGOL™ TPS-SEBS Compounds

The MEGOL™ family of TPE compounds offers the ideal combination of the elasticity and look and feel of rubber in combination with the low processing costs of thermoplastics. MEGOL™ TPS-SEBS Compounds provide a wide range of optimum cold and hot elasticity, UV and age resistance, low emissions and low fogging, a large processing window, great looking, excellent soft-touch properties, and a good compression set.

RAPLAN™ TPS-SBS Compounds

RAPLAN™ are SBS (styrene butylene styrene) elastomer-based thermoplastic compounds. The elastomer phase provides the elastic property and the softness characteristic of rubber to the compounds. RAPLAN™ TPS materials are an ideal substitute for PVC when halogen-free products are required. The use of specific additives improves this feature. Ideal for overmolding on polystyrene, RAPLAN™ is also suitable for injection-molding, footwear, and for extrusion.

Olefinic thermoplastic elastomers (TPO)

APIGO™ TPO Compounds

APIGO™ materials consist of polyolefin-based compounds modified with elastomers and were created to meet market demands for light products that are highly resistant to low temperatures. APIGO™ TPOs are alternatives to flexible PVC wherever halogen-free materials are required.

NEOGOL™ OBC Compounds

NEOGOL™ OBC are olefin block copolymer-based thermoplastic compounds (TPO) on a "styrene-free" chemical structure, offering excellent resistance to UV rays and aging. NEOGOL™ OBC's exceptional processability ensures high aesthetic quality with large surface areas and at very reduced thicknesses. Above all suited to injection molding, they may be supplied in grades suitable for contact with food. An excellent substitute for PVC in the production of halogen-free articles, they provide a valid alternative to conventional TPEs in applications not requiring specific physical-mechanical properties.

Thermoplastic rubber vulcanizates (TPV)

TIVILON™ TPV Compounds

TIVILON™ is a family of TPE products based on dynamically Vulcanized Thermoplastic Elastomers (TPVs). It provides high elasticity at low and high temperatures, excellent compression set, UV resistance and high melt flow. TIVILON™ is particularly well-suited to bonding with other materials for co-molding and co-extrusion with polyolefins and their compounds.

Urethane thermoplastic elastomers (TPU)

APILON™ 52 TPU Polymers and Compounds

APILON™ 52 is a line of thermoplastic polyurethane (TPU) with excellent mechanical properties, high elasticity and superior resistance to low temperatures. APILON™ TPUs are very durable and suitable for applications where a high level of resistance to abrasion, oils, and fats is necessary and can be customized to suit specific application requirements.

APILON™ 52C TPU Polymers and Compounds

APILON™ 52 C are urethane-based thermoplastic elastomers (TPU) developed for the production of synthetic fabrics by dissolving them in solvents and then subsequent coagulation. They stand out for their excellent physical-mechanical characteristics which provide unique toughness, abrasion resistance, flexibility and elasticity at a range of working temperatures. APILON™ 52 C includes soft and rigid grades (ester-, ether-, and hybrid ester-ether-based), special polycarbonate-based grades, and other innovative grades which are the result of polymer alloys.

Copolyester thermoplastic elastomers (TPC)

API L™ TPC Compounds

API™ L is a block polyether-polyester thermoplastic elastomer (TPC), ideal for components which require maximum fatigue resistance, elasticity, toughness (even at low temperatures), tear resistance and chemical resistance.

EVA-based Compounds

APIFIVE™ EVA-based Compounds

APIFIVE™ are EVA-based expandable and cross-linkable compounds, modified with elastomers to enhance their softness, opacity, and soft-touch whilst maintaining optimum aesthetic appeal. APIFIVE™ grades are available in different expansion grades and in a broad range of colors. All these products are characterized by their low density enabling lightweight applications.

APIZERO™ EVA-based Compounds

APIZERO™ products are crosslinkable and expandable products based on EVA (ethyl-vinyl acetate) for injection molding. APIZERO™ grades were developed to meet the market needs for materials to produce light and sustainable applications. It can successfully compete with conventional products such as two-component polyurethane.

Bioplastics Product Portfolio



Over the last years, Trinseo has introduced soft-touch bioplastics in a growing number of new applications responding to the increased market demand and consumer needs for sustainable products. Our bioplastics portfolio includes advanced biodegradable and/or bio-based polymers and compounds.

Our Bio & Beyond strategy is aligned with Trinseo's commitment to sustainability and corporate social responsibility. The focus on environmental and social responsibility is intrinsic to who we are as an organization.

We are aware of many specific requirements that our customers products have to meet. Therefore, we divide bioplastics into bio- based and/or biodegradable.

Bio-based means "from nature to plastic". Plastic is derived from petroleum or natural gas while bio-based traditional plastics are to a varying degree derived from renewable biomass sources, such as cornstarch, sugarcane, sugar beet, cellulose, or vegetable oils.

Biodegradability stands for the potential degradation of a plastic by the action of microorganisms (such as bacteria, fungi, algae) to carbon dioxide (and/or methane), water, mineral salts and biomass. In a composting environment, biodegradable bioplastic will degrade into CO₂ and water – caused by bacteria or other biological means.

APINAT™ BIO

Biodegradable TPC Compounds

APINAT™ BIO is a range of biodegradable thermoplastic bioplastics (TPE-E or TPC) which conform to the EN 13432 standard. These compounds include soft and rigid grades, special food contact approved grades and the “OK compost” certification of compostability.

APINAT™ BIO is the only soft biodegradable bioplastic available on the market, with an international patent. These bioplastics enable the production of rigid-soft applications through overmolding which are totally biodegradable.

APINAT™ F BIO

Biodegradable TPC Compounds

APINAT™ F BIO is a range of biodegradable thermo-plastic bioplastics which are compostable in accordance with the standard EN 13432. These compounds are suitable for flexible packaging (such as shopping bags) and mulching.

They are easily processible with standard blow extrusion equipment. APINAT™ F BIO materials include special food contact approved grades with the “OK compost” certification of compostability.

APIGO™ BIO

Bio-based TPO Compounds

APIGO™ BIO are olefin-based thermoplastic bioplastics (TPE-O or TPO) containing raw materials from renewable resources. They guarantee the same physical-mechanical properties and the same processability as traditional fossil-based TPE-O. The APIGO™ BIO materials include soft and rigid grades, special food contact approved grades and they have a biocompatibility certification.

APILON™ 52 BIO

Bio-based TPU Polymers and Compounds

APILON™ 52 BIO are urethane-based thermoplastic bioplastics (TPE-U or TPU) containing raw materials from renewable sources, offering the same performance as traditional fossil-based TPE-U. The family of APILON™ 52 BIO materials includes soft and rigid grades (ester, ether, ester-ether-based). We also offer special haptic compounds which give the product rubbery and matt properties.

APIGO™ BIO and APILON™ 52 BIO offer significant environmental benefits by reducing the emissions of greenhouse gases (e.g. CO₂) and saving fossil-based resources for future generations.



Memberships

Trinseo is a membership of the associations European Bioplastics and Assobioplastiche.


www.european-bioplastics.org


www.assobioplastiche.org

Optimized Adhesion for Overmolding

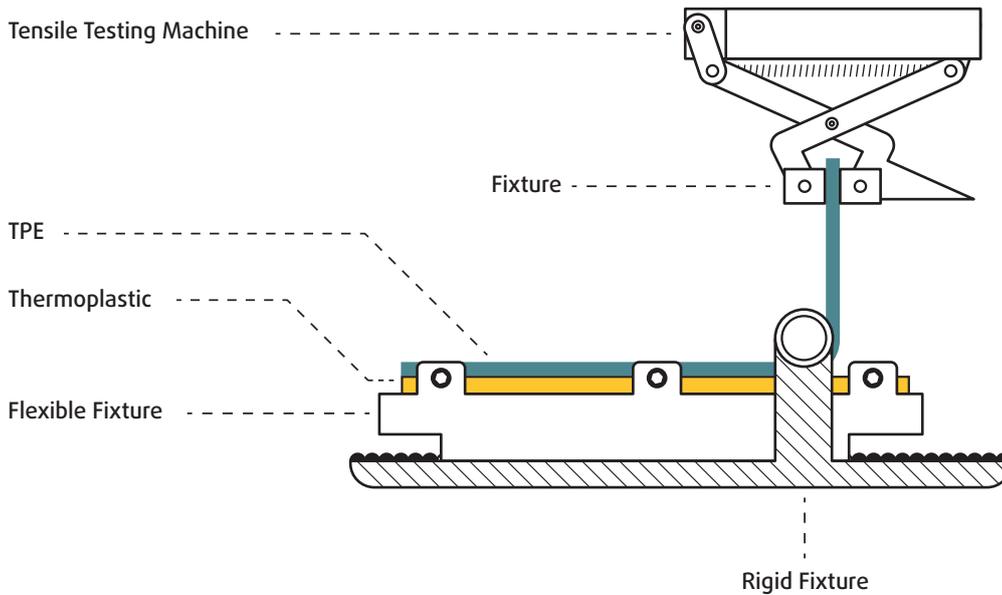
For overmolding, Trinseo ABS and PC/ABS as well as our broad range of adhesion-modified TPEs provide optimized bonds without the use of primers, adhesion promoters or surface treatment. Our modified TPEs can also be overmolded on polyamides (PA6, PA66, PA12), polyesters (PBT, PET), POM and other polar polymers such as SAN, ASA, PMMA, and polyolefins (PP and PE), including special blends and reinforced materials.

In our Specialized Overmolding Center (SOC), we measure the adhesion between soft and rigid components in accordance to the VDI 2019 testing method standards. We played an active part in co-developing these standards. Our state-of-the-art equipment can determine the adhesion of overmolded materials independent of the main injection molding variables, including:

- Material temperature
- Mold temperature
- Injection speed
- Injection pressure/post pressure



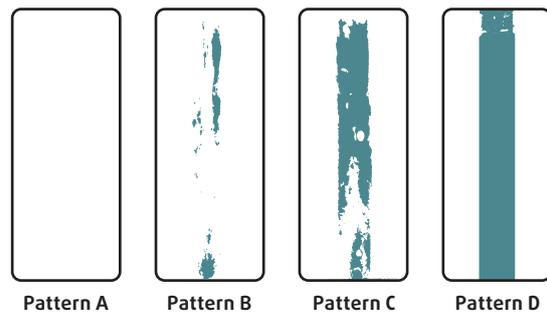
VDI 2019 Peel Test Setup



VDI 2019 Classification Codes

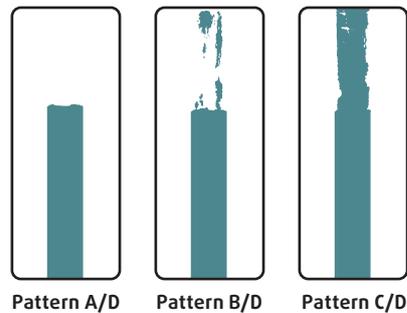
The first character describes the TPE residue on the rigid substrate after the peel test.

- | | |
|----------|---|
| A | No TPE residue on hard component |
| B | (1-50%) TPE residue on hard component |
| C | (50-99%) TPE residue on hard component |
| D | Sample destruction, soft component torn off (≤ 15 mm) |



The second character (if present) indicates whether the TPE strip breaks during peeling at any point along the peel path.

- | | |
|------------|---|
| A/D | No TPE residue on hard component; TPE strip will tear off |
| B/D | (1-50%) TPE residue on hard component; TPE strip will tear off |
| C/D | (50-99%) TPE residue on hard component; TPE strip will tear off |



Color Expertise

Trinseo's color expertise has been expanded with our extensive know-how in color development for soft-touch polymers.

APICOLOR™ is a range of color masterbatches available in different polymer bases including biodegradable TPC.

Our portfolio of APICOLOR™ Masterbatches was developed with the aim of obtaining the best color match possible whilst guaranteeing optimum compatibility with the processed product and without altering its intrinsic properties.

Manufacturers in all relevant markets rely on our APICOLOR™ Masterbatches that are also available as heavy metal-free versions, special food contact approved grades (10/2011/EU, FDA), as well as biodegradable and non-toxic grades (APICOLOR™ B series).



Main technical characteristics of APICOLOR™ Masterbatches are:



Wide range of polymer carrier resins: PE, EVA, PVC, PS, TPU, biodegradable APINAT™ BIO



Colors based on the ranges PAL, PANTONE, NCS



Tailor-made colors as requested by our customers

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Trinseo and its affiliated companies have a fundamental concern for all who make, distribute, and use their products and for the environment in which we live. This concern is the basis for our Product Stewardship philosophy by which we assess the safety, health, and environmental information on our products so that appropriate steps may be taken to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Trinseo products – from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

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