



Platilon® Dureflex®

Multi-functional thermoplastic
polyurethane (TPU) film -
the material of choice.



Why Covestro TPU Films?

The demand by consumers and producers of materials remains high. Independent of the application, high-quality standards and performance are not compromised.

This is where thermoplastic polyurethane (TPU) films show their strength. Dureflex® and Platilon® TPU films, manufactured by Covestro, represent a wide range of polymer compositions with excellent mechanical, chemical and thermal properties.

Thanks to the near unlimited potential to modify our products, Covestro can offer TPU monolayer, multilayer and co-extruded films customized to meet your specific needs and requirements. This benefits our customers in particular, with whom we work in close partnership to maximize their success.

We are also driving the development of our customized TPU films with sustainability in mind. Our efforts in this regard include waste reduction, the use of bio-based instead of fossil fuel raw materials, and pursuing a mass-balancing approach.



TPU Properties

Thermoplastic polyurethanes are high-tech materials with a unique combination of versatile properties. TPU bridges the gap between hard thermoplastics and rubber. For instance, it can be deformed under tensile load, yet still returns to its original shape afterwards. Thanks to its molecular structure, TPU can be heated, melted and molded all over again.

The general properties of TPU are comprised of:

- Adhesion – natural adhesion to a variety of substrates
- Abrasion resistance
- Barrier – air and liquid barrier properties
- Elasticity – high elasticity over the entire hardness range
- Flexibility over a wide temperature range
- Heat resistance
- High mechanical strength
- Printability
- Skin-contact medical grades
- Solvent- and plasticizer-free
- Tear and cut resistance
- Ethylene oxide (ETO)/Gamma sterilizable
- Suitable for heat lamination

Numerous forms of processing are possible: TPU films are very suitable for thermal and flame lamination or for common welding processes. The material also offers excellent thermoforming properties.

Understanding the differences between the TPU types

TPUs generally can be separated into three types: These three different types of TPUs are aliphatics, aromatic polyesters and aromatic polyethers, which have certain, yet distinct qualities that make one more suited for a particular application.

Aliphatics

- UV resistant
- Laminate to glass and polycarbonate sheet

Aromatic Polyesters

- Effective barrier to gases
- Resistant to petrochemicals (e.g., gasoline, diesel fuel, aviation fuel, etc.)
- Resistant to many solvents, chemicals, fats, and greases

Aromatic Polyethers

- Resistant to water, high humidity, and fungus
- Offer excellent hydrolytic stability
- Softer and more comfortable for skin contact
- Breathable – Impermeable to liquids but highly water vapor permeable



Multi-functional TPU film

Comparison of TPU to other films

Grade	Thermoplastic Polyurethane	Flexible PVC	Co-Polyester *	EVA (25% VA)	LDPE	HDPE
Shore Hardness	70 - 95A	60 - 95A	30 - 80D	85A	55D	50 - 76D
Specific Gravity (Gms/cm3)	1.14 - 1.35	1.30 - 1.50	1.07 - 1.28	0.95	0.915 - 0.94	0.94 - 0.97
Ultimate Tensile Strength (PSI)	4000 - 10000	2000 - 6000	2000 - 7500	4400	1300 - 2500	7000 - 7500
Ultimate Elongation (%)	350 - 800	200 - 450	200 - 600	875	100 - 700	500
Tear Strength (PLI)	300 - 700	N/A	100 - 300	350	N/A	330
Puncture Resistance	Excellent	Good	Good	Fair	Poor	Poor
Abrasion Resistance	Excellent	Fair	Good	Fair	Good	Excellent
Oil Resistance	Good	Fair/Good	Good	Good	Good	Good
Acid Resistance	Good	Fair	Fair/Good	Good	Good	Good
Aqueous Solution Resistance	Good	Good	Good	Good	Good	Good
Ozone Resistance	Excellent	Excellent	Excellent	Excellent	Good	Good
Water Resistance	Good/Excellent**	Good	Good	Good	Excellent	Excellent
Low Temperature Flexibility	Excellent	Fair/Good	Fair	Good	Good	Good
Fabric Lamination	Excellent	Fair/Good	Fair	Fair	Fair	Poor
Heat Sealing	Y	Y	Y	Y	Y	Y
Solvent Welding	Y	Y	Y	Y	N	N
RF Welding	Y	Y	Y	Y	N	N
Thermoforming	Y	Y	Y	Y	Y	Y

* Copolyester data based on commercially available grade

** Polyester TPU - Good and Polyether TPU - Excellent



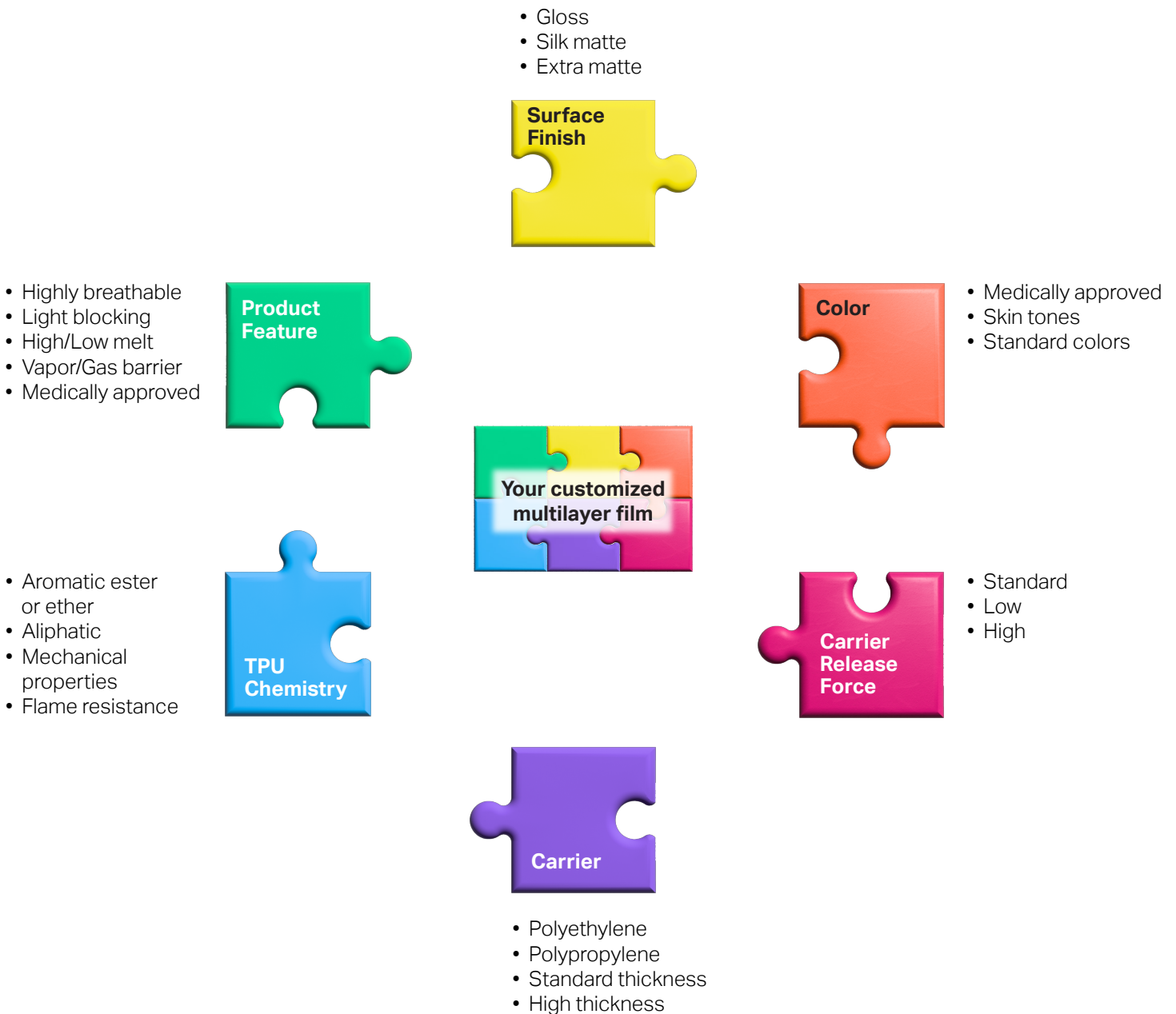
Multilayer film – a toolbox for your needs

Each individual TPU film brings its customized properties; however, the combination in a multilayer film brings a higher level of performance. In this case, the total performance really is greater than the sum of the parts.

Covestro's multilayer blown film capability allows different technologies and properties to be combined in a single processing step.

Multiple features, like polymer carriers, surface finishes, colors and TPU chemistries can be brought together simultaneously to deliver a customized solution while still using a highly cost-effective manufacturing process.

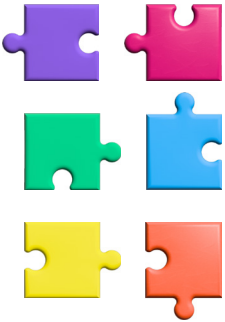
Multilayer toolbox options



Multilayer toolbox in practice

As part of a general drive to produce more sustainable and even better tolerated products, a customer was considering replacing its solvent-based TPU as a backing material for a wound dressing.

Critical requirements:



- A carrier with low release force for easy processing
- High breathable Ether-TPU film for exudate management and long wear time
- Low friction, high matte-effect surface for a premium appearance and feel
- Medically approved materials for the Class 2 device

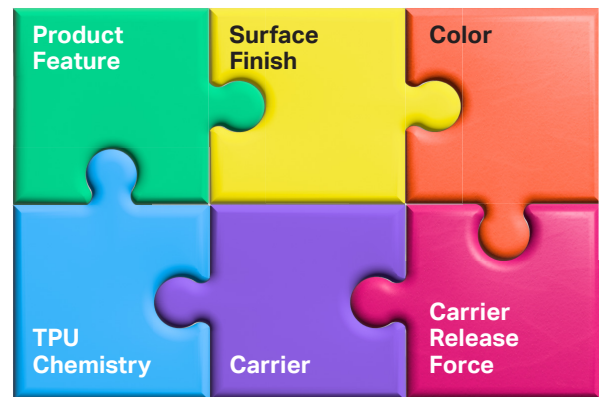
Easy solution

By using Covestro multilayer technology, the customer was provided the product they needed:

Covestro was able to supply a 1mil (25micron) TPU film with an MVTR of 4000g/m²/day, a medically approved color and a matte surface finish on the film.

The TPU film came with a carrier that had a release force adjusted to strip easily during processing.

All of this was performed in a single process step which makes it possible to deliver a customized solution at an attractive price.



Wound dressing with TPU film and foam layers



A wide range of applications

With many different properties, the possible combinations of customized solutions are endless. TPU films are suitable for a wide range of consumer, industrial, medical, security, and mobility applications



Automotive

- Seating
- Sun roof roll-up shades
- Steering wheel heater
- Sound insulation



Medical

- Smart patches
- Wound dressing
- Surgical drapes and packaging



Construction

- Pipe relining
- Roof membranes
- Awnings
- Window shades



Textile/ Sports & Leisure

- Rain gear
- Tents
- Footwear
- Sleeping bags
- Emblems



Security & Protection

- ID-cards
- Bullet-proof vests
- Bullet resistant glazing



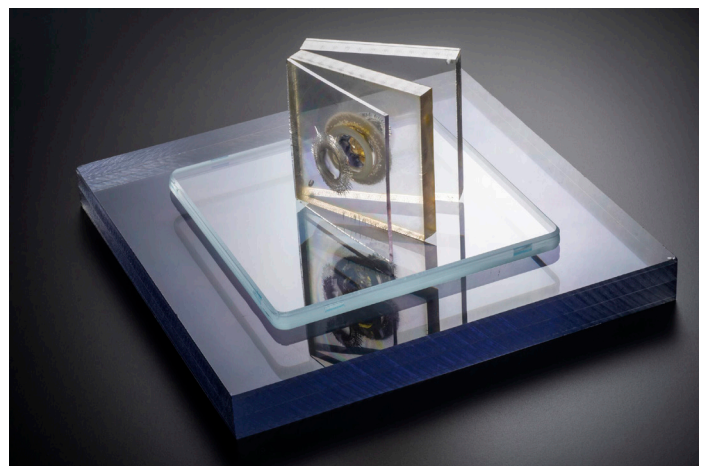
Embedded Electronics

- Wearables/Diagnostics
- Flexible circuits
- Embedded chips
- Heating and Lighting elements

Want to learn more?

Covestro Specialty Films has a global technical and manufacturing footprint to support customers in Asia, Europe and the Americas. We are always ready to work with you in developing customized features that will provide the perfect combination of performance.

Reach out to us or visit the Covestro Solution Center to see more about Specialty Films solutions (www.films.covestro.com) or send an email to films@covestro.com.



Multi-functional TPU film



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