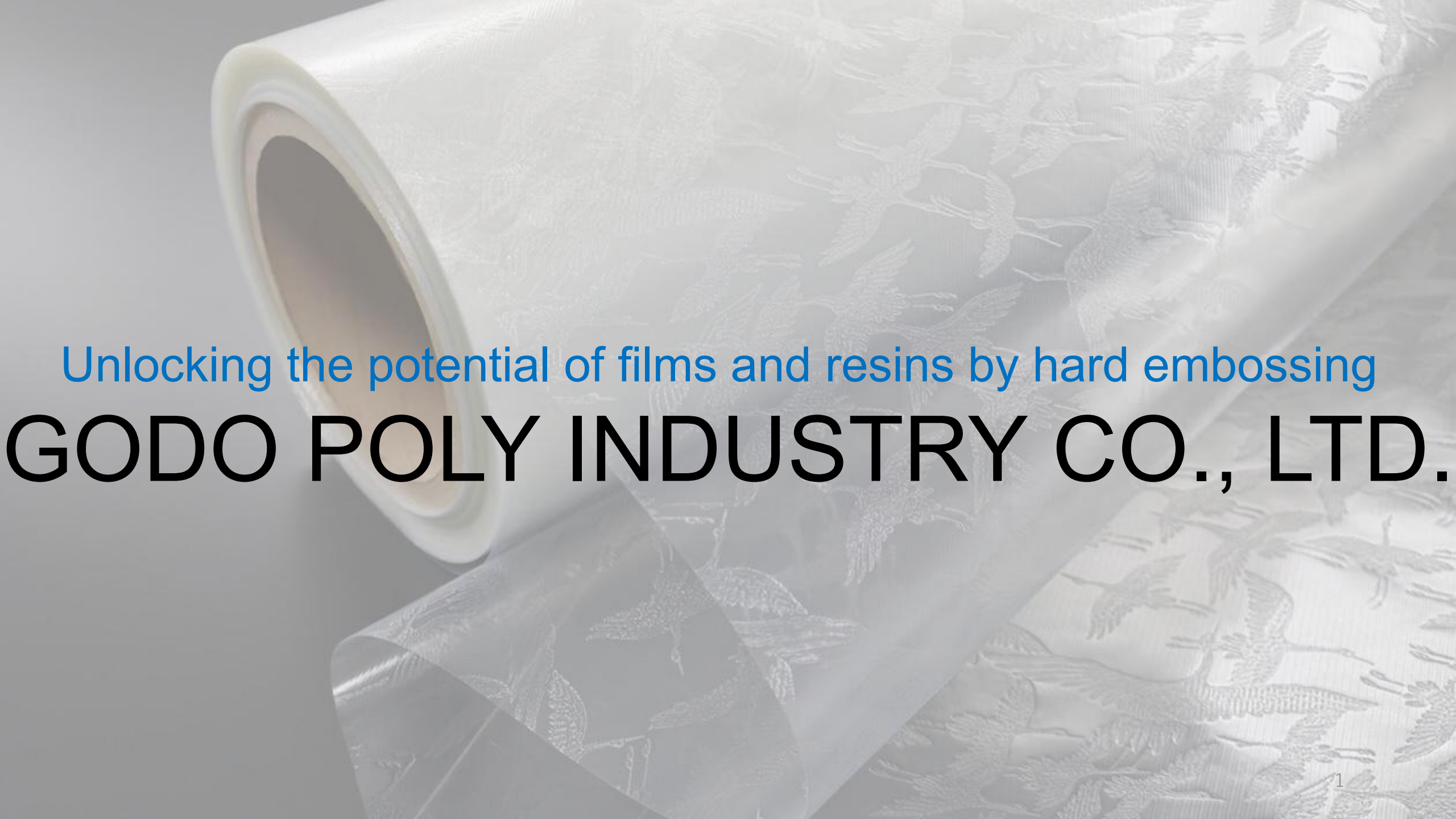


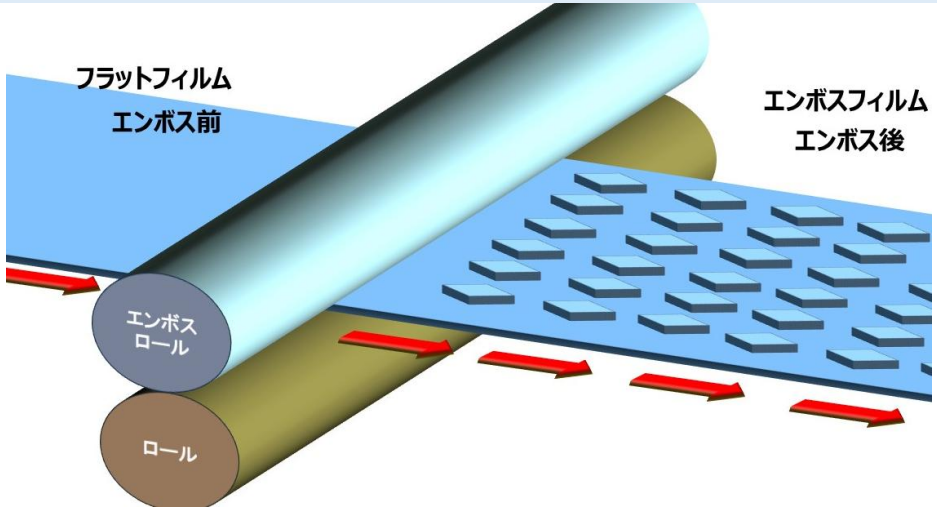
Unlocking the potential of films and resins by hard embossing

# GODO POLY INDUSTRY CO., LTD.

# Our Embossing Process

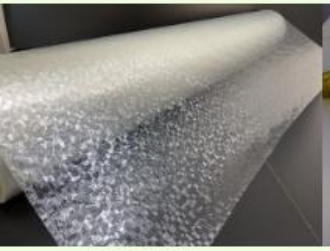
Embossing is a processing method that uses a mold to create patterns and textures on the surface of a film.


We perform post-embossing using continuous roll-to-roll molding.

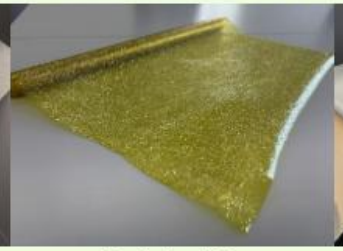


# Features of the “Hard Embossing” Process

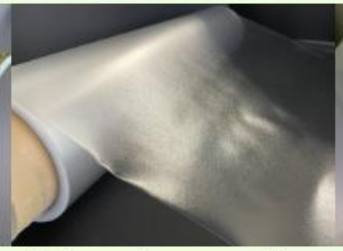
## Embossing can be done on a wide variety of film materials



PET film (biaxially oriented PET)



Polyimide (PI)

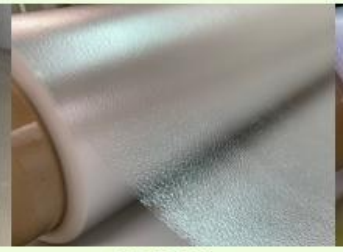


Polycarbonate film (PC)

PEN film

Vacuum deposition, printing, and coating

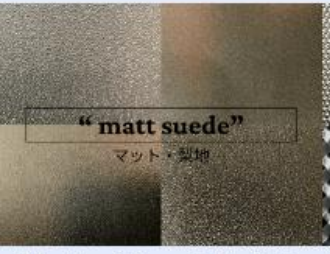
Multi-layer film



OPP film

CPP film

## A rich lineup of over 100 patterns




Matte/Pearl finish

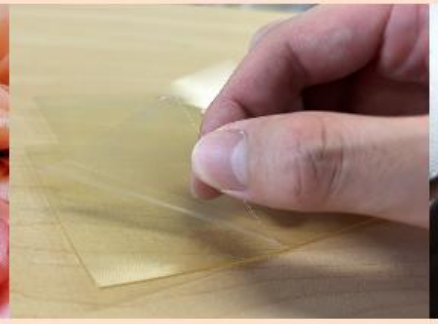

Lattice and Diamond


hairline


Bark and wood grain

## We improve the functionality and design of film materials to meet customer needs and solve problems.

Resin transfer and design



Improved mold release and peelability

Matte effect

Improved surface roughness


Re embossing (recycled)

Improved slipperiness and reduced friction

Light diffusion effect

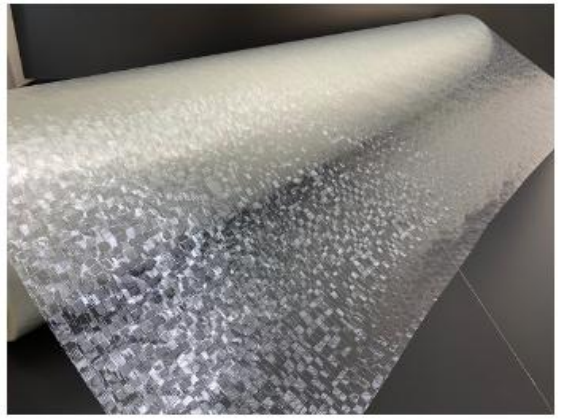
Provides space and prevents adhesion


Chemical-free

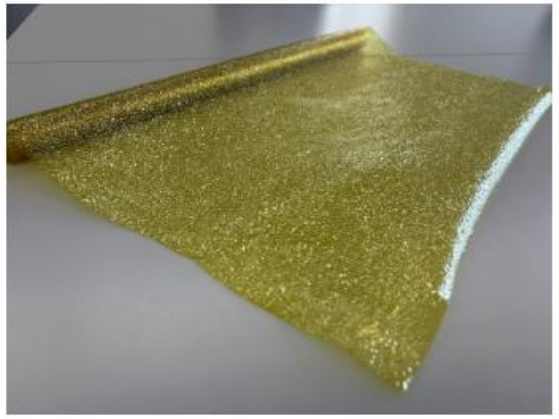
# Features of the “Hard Embossing” Process

Material

Embossing can be applied even to high-rigidity and high-heat-resistant films that are difficult to process. You can choose the most suitable materials.

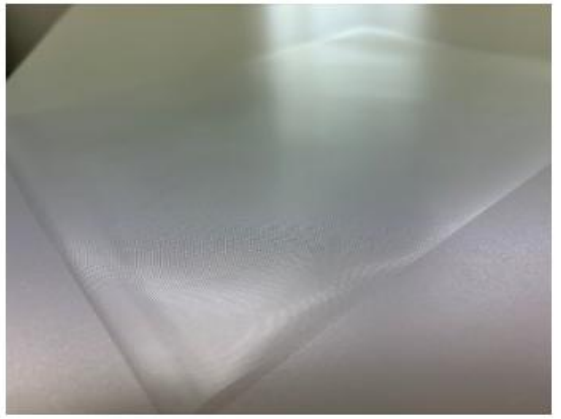


**BOPET**

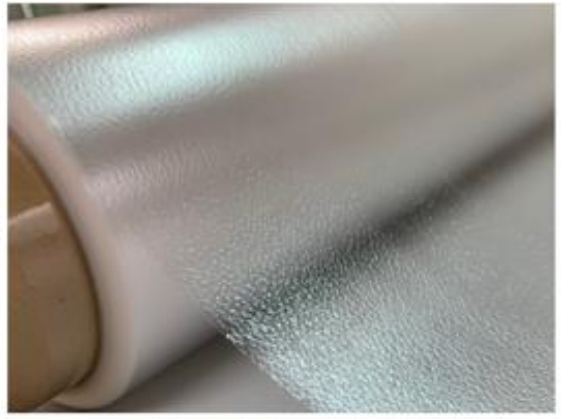


**Polyimide**

**Polycarbonate**

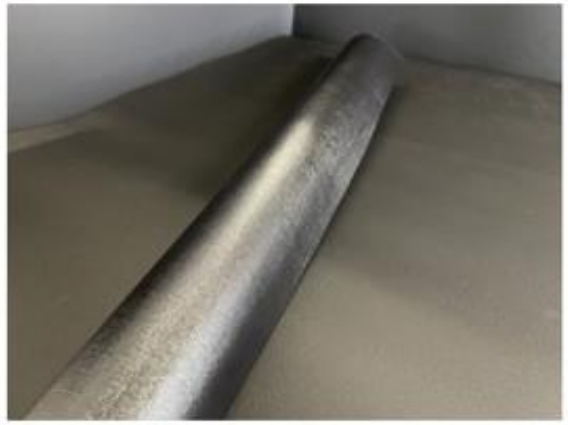


**PEN**



**OPP**

**CPP**



**Multilayer Film**

- **PBT**
- **Fluorine**
- **PEEK**
- **Polyamide**

**etc…**

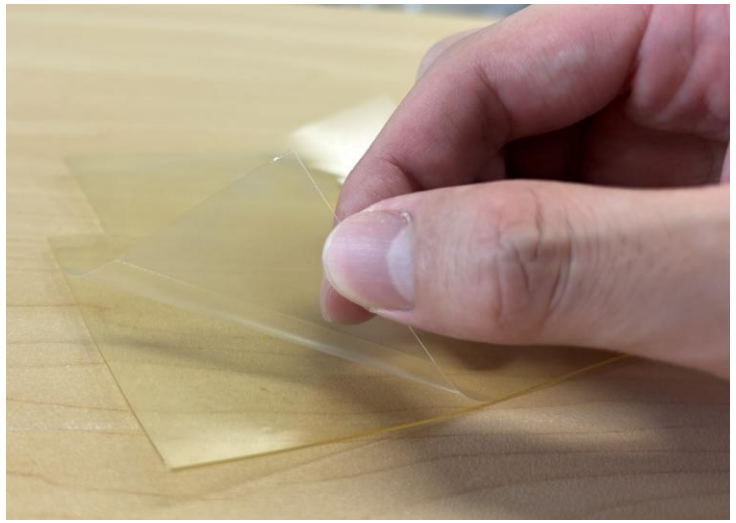
# Features of the “Hard Embossing” Process

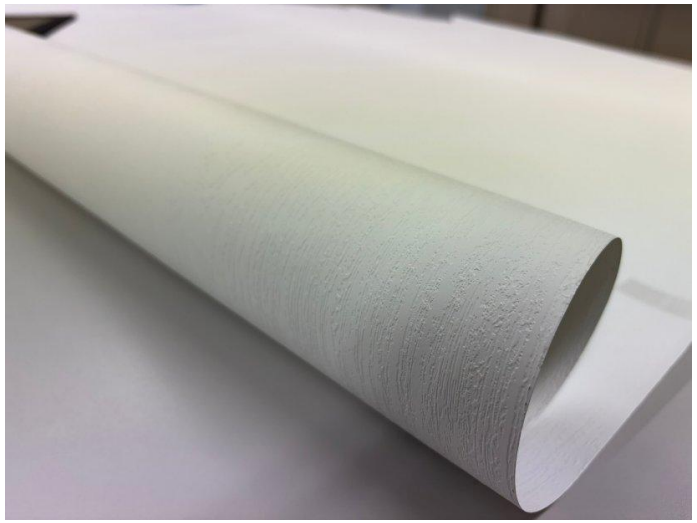
Material

Embossing can also be applied to films that have undergone treatments such as coating, compounding, printing, or vapor deposition.
Embossing various materials, we expand the potential of films.

(Application Examples)

- ✓ Embossing a release film further enhances its release properties.
- ✓ Embossing a matte film and transferring it onto resin creates a matte, luxurious surface on the plastic without gloss.





# Features of the “Hard Embossing” Process

Embossing can be applied to thick films and films with a wide width.

## Films of various thicknesses can be processed (Base film thickness: 12μm to 250μm)

You can select films according to your application, such as using thicker films when stiffness or high heat resistance is required.


## Embossing can be applied to wide films, up to a maximum width of 1650 mm.

It can also be used for resin transfer applications that require large-area embossed films.

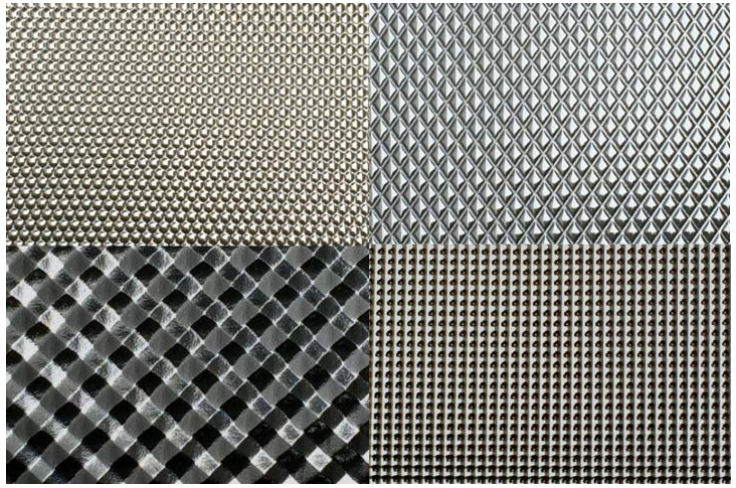
Embossing Specifications

# Features of the “Hard Embossing” Process

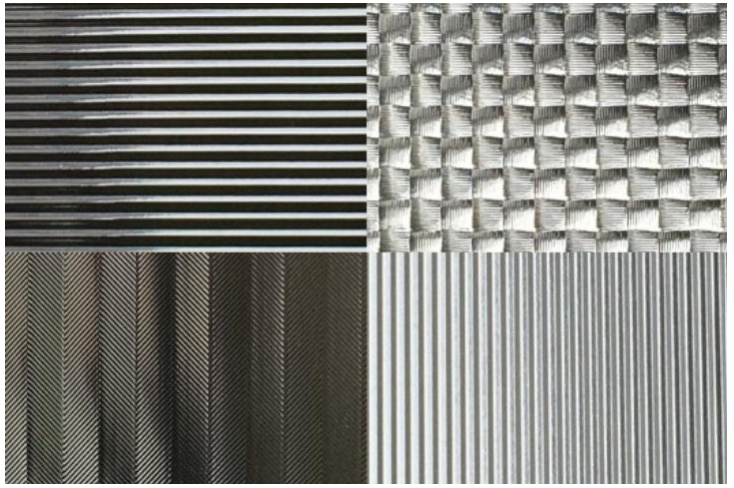


## More than 100 patterns to choose from (custom patterns also available).

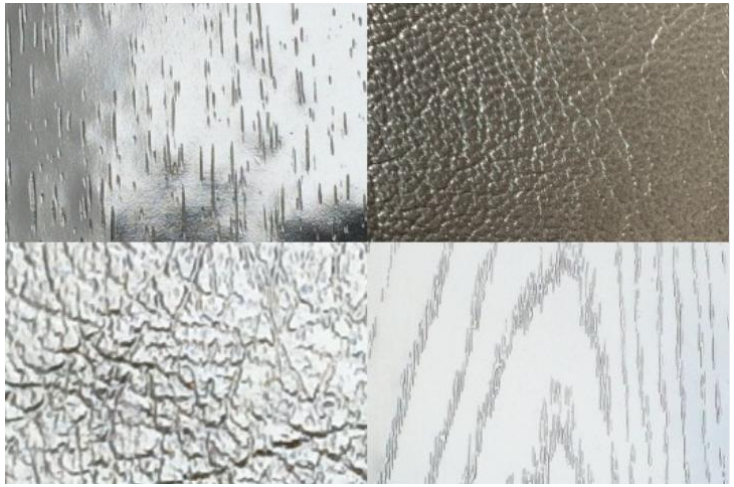
**Matte / Pear-Skin Texture**



**Checkered / Diamond**



**Stripe / Hairline**



**Woodgrain / Leathergrain**

**Decorative / Design**

# Features of the “Hard Embossing” Process

Hard Embossing process achieves depths and surface roughness that are normally difficult to attain.

The surface can be made either coarsely rugged or finely textured.

Even with the same pattern, we adjust processing conditions to achieve your desired results, such as depth and roughness.

Sample with 1.2 mm Depth

Enlarged Image of Matte Embossed Film with 3μm Depth

# Features of the “Hard Embossing” Process

## We also offer high-heat-resistant processing methods.

In addition to standard embossing, our heat-resistant processing method achieves high thermal durability.

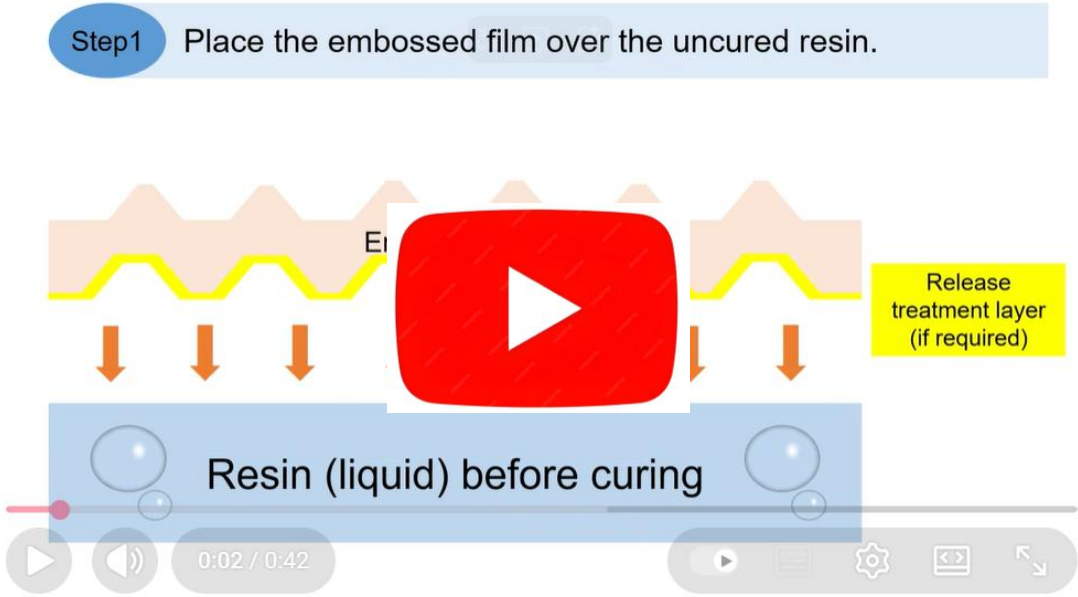
(Usable at around 150 °C under ambient conditions; however, compatible patterns are limited.)

# Typical Applications of Hard Embossed Films (Resin Transfer)

Hard embossed films are used in about half of our projects by transferring their patterns onto resin.By pressing the hard embossed film onto uncured resin and then curing it, the film's patterns and textures are transferred onto the resin surface.

Check out the introduction video at the link below.

https://www.youtube.com/watch?v=UffYw1ww5Eg



# Functions of Hard Embossed Films



Goudou

By creating patterns, the film or resin is endowed with the following functions.

## Visual Effects

- **Design & Decoration**
  - Matte Finish
  - Luxury Appearance
  - 3D Effect
  - Eye-catching Quality
- **Visual Protection**
  - Scratch Concealment
  - Frosted Glass Effect
- **Light Control**
  - Light Diffusion
  - Gloss Adjustment

## Tactile Effects

- **Texture Enhancement**
  - Rough Texture (Surface)
  - Smooth Moisture Feel
  - Natural Material Simulation
- **Writing Performance**
  - Writing Comfort
  - Erasability

## Spatial Enhancement

- **Release Property**
- **Air Ventilation**
- **Adhesion Prevention**
- **Cushioning**
- **Heat Insulation**
- **Condensation Prevention**
- **Flow Control**
- **Surface Area Enhancement**
  - Heat Dissipation
  - Light Collection Efficiency

## Slip Properties

- **Slip Enhancement**
  - Friction Reduction
  - Durability Improvement
- **Anti-slip**
  - Grip Enhancement
- **Surface Protection**
  - Scratch Prevention
  - Durability Enhancement

# Application Fields of Hard Embossed Films

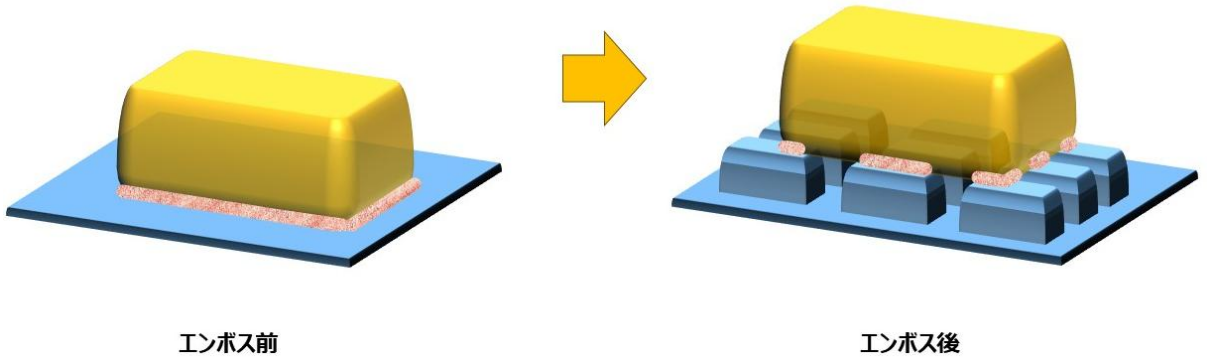


Hard embossing enhances the functionality and aesthetic appeal of films and resins, making it suitable for a wide range of applications, including the following fields:

# [Application 1] Improving Release and Peeling Performance



By reducing the contact area through textures, embossing enhances release performance.
Since embossing is a physical process formed using only heat and pressure, it can create silicone-free release separators with no residue or bleed-out.


| Usage | ✓ Release separators (improved release and air escape performance)<br>✓ Interlayers to prevent excessive adhesion of rubber or gel<br>✓ Materials for adhesive tapes<br>✓ Separators for thermal dissipation sheets |
|---|---|

Silicone-Free Separator with Embossed Film! Prevents Adhesion and Adjusts Peel Strength!

# [Application 1] Improving Release and Peeling Performance



## Hard embossed films address the following release-related issues.

| Issue | Solutions Using Hard Embossed Films |
| --- | --- |
| Insufficient release force of the release separator / needs fine adjustment. | Embossed textures can improve release performance. By embossing release films, the release force can also be finely adjusted. |
| Release performance is required, but for precision or rubber processes, the following should be avoided:<br>・Silicone release films<br>・Sand-matte films with potential residue<br>・Printed or coated films with risk of peeling | Embossed separators are created using a physical process with only heat and pressure, eliminating concerns about additives, sand, or slippage. |
| The object adheres tightly to the resin surface and cannot be removed. | By transferring the embossed film pattern onto the resin surface, textures are created that prevent adhesion. |

[Silicone-Free Separator with Embossed Film! Prevents Adhesion and Adjusts Peel Strength!]

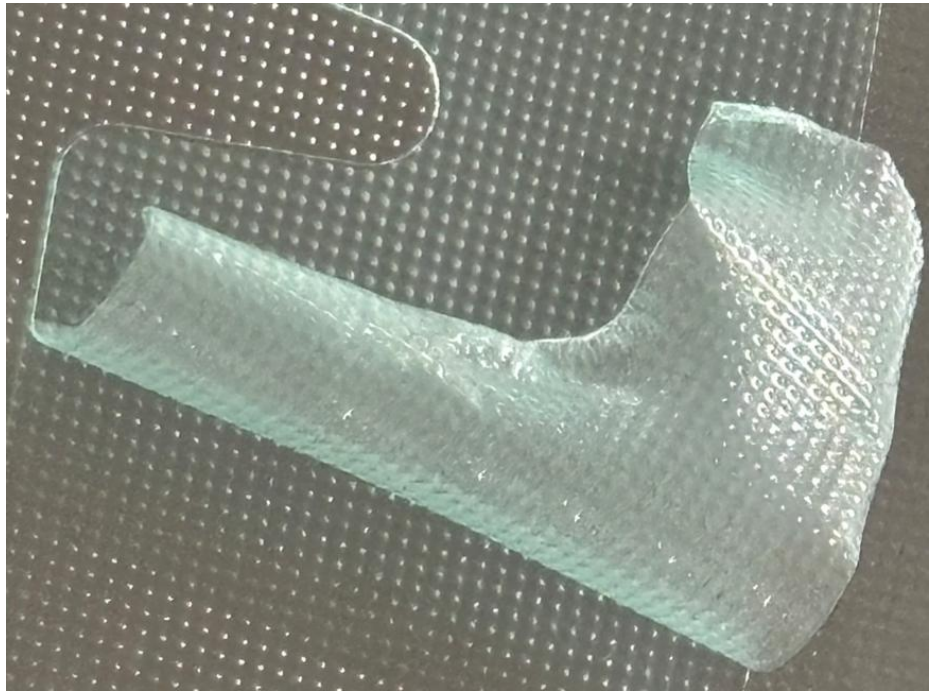
# [Application 1] Improving Release and Peeling Performance



The film itself lacks stiffness and grip, making it difficult to peel off.

Forming patterned textures increases the film's strength and stiffness, improving peelability and ease of handling.

By forming a uniform pattern, even thin film liners gain stiffness, making them easier to peel.



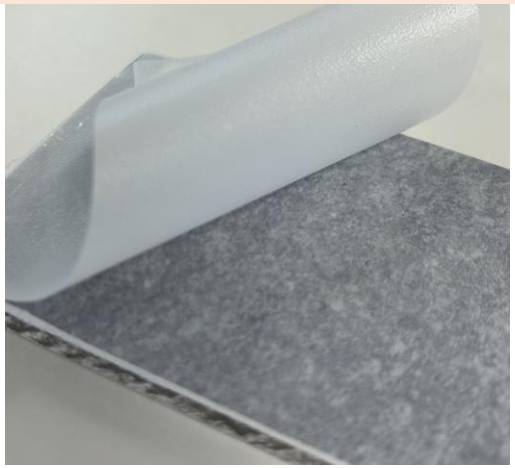
When the embossed pattern of the liner is transferred to the product side, it improves air release, allowing the material to adhere smoothly and evenly.

[Silicone-Free Separator with Embossed Film! Prevents Adhesion and Adjusts Peel Strength!]

# [Application 2] Adding Design and Tactile Properties



Used as a transfer film for UV- and heat-curable resins (such as acrylic, urethane, FRP, and polyester) or elastomers, it imparts decorative textures and tactile properties to the resin surface.



By transferring embossed patterns onto resin, the appearance and texture of stone can be replicated.

Hairline Wood

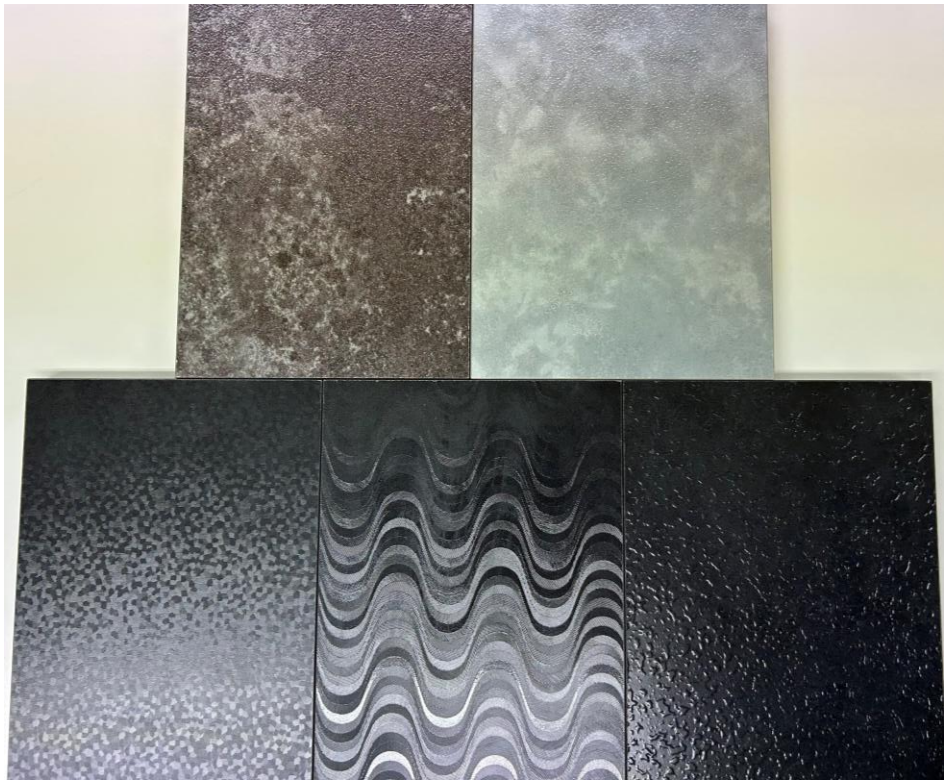
↑Since it is UV-cured, it is more scratch-resistant than materials scratched on metal.

Transferred onto FRP resin to create a frosted-glass finish on carport surfaces (providing both design and light-blocking properties).

Transferred onto FRP resin for bathroom floors, adding both design and functionality (pattern height: 1.5 mm).

# [Application 2] Adding Design and Tactile Properties

Used as a transfer film for UV- and heat-curable resins (such as acrylic, urethane, FRP, and polyester) or elastomers, it imparts decorative textures and tactile properties to the resin surface.



This sample was cured using electron beam (EB) irradiation, transferring the embossed film pattern onto the resin.

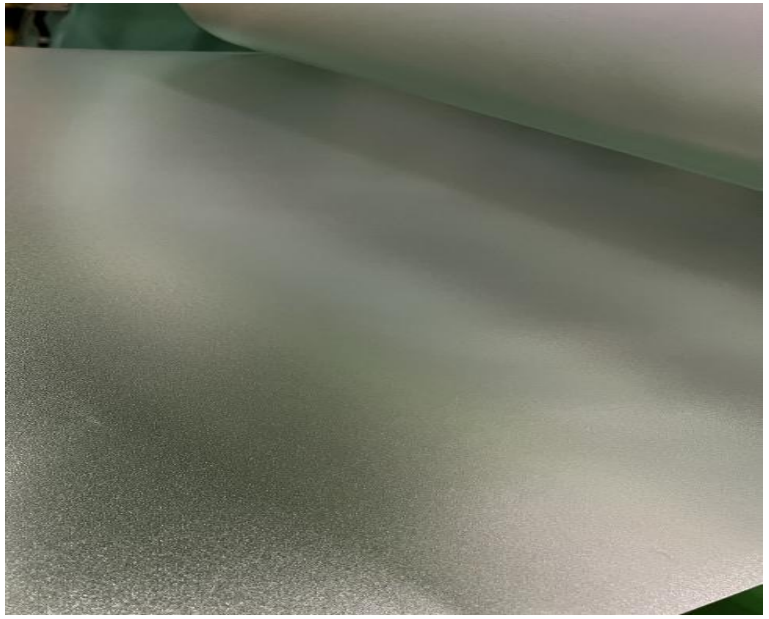
← It replicates the appearance and texture of the real material.

←It sparkles when viewed from different angles.

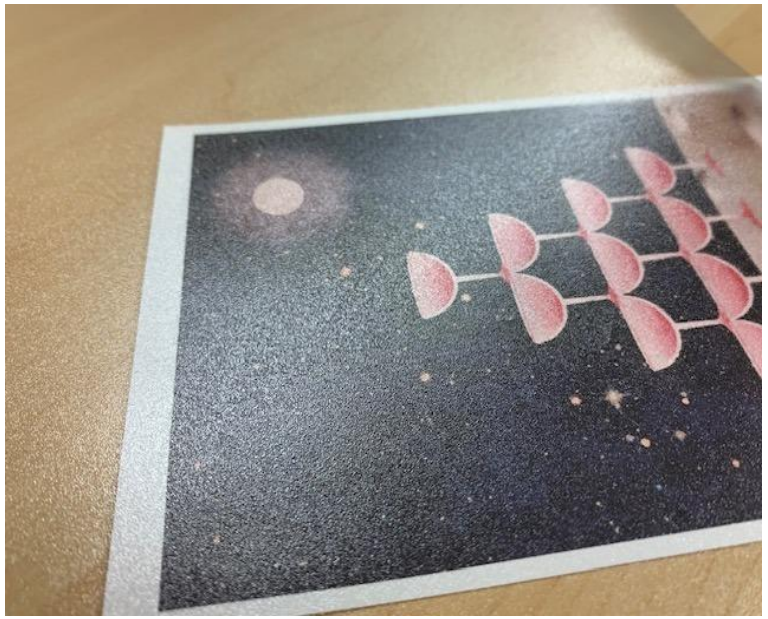
What is transfer film? Forming embossed shapes into resin to impart functionality and design!

# [Application 2] Adding Design and Tactile Properties

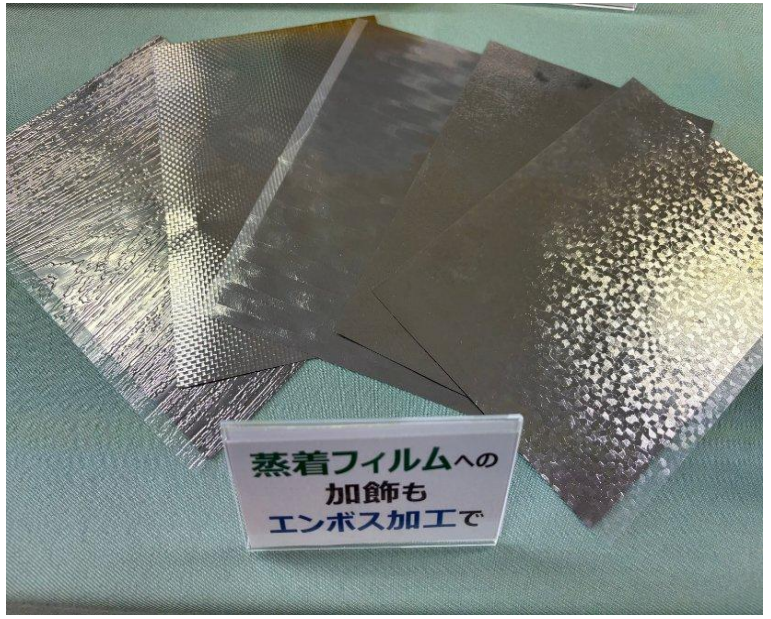
It can be used as an overlaminate film for POP displays and label liners (also providing surface protection, dirt resistance, and anti-slip functionality through its textures).



Embossing provides:
・A matte finish
・Surface protection
(prevents dirt adhesion)
・Anti-slip properties



Embossing provides:
・A matte finish
・Surface protection




The embossed textures diffuse and scatter light, further enhancing visual impact.

# [Application 3] Matte and Anti-Gloss Effects



## The embossed textures diffuse light, creating an anti-glare, matte effect.


| | |
|---|---|
| Usage | ✓ Window Films<br>PET provides rigidity for shatter prevention, and embossed textures offer shielding, frosted-glass aesthetics, dirt resistance, condensation prevention, and thermal insulation.<br>✓ Films for Matte Transfer onto Resin<br>By embossing transparent or matte films and transferring them onto resin, the resin surface gains a matte finish and a premium feel.<br>✓ Hiding Scratches, Dents, or Patterns during Resin Manufacturing |

# [Application 4] Enhancing Surface Roughness



## Achieves a rough surface with Ra ≥ 0.8.


| Usage |
| --- |
| ✓ Films for Polishing Processes<br>✓ Films for Electronic Processes<br>✓ Films for Resin Transfer<br>✓ Textures for Fingerprint Resistance |

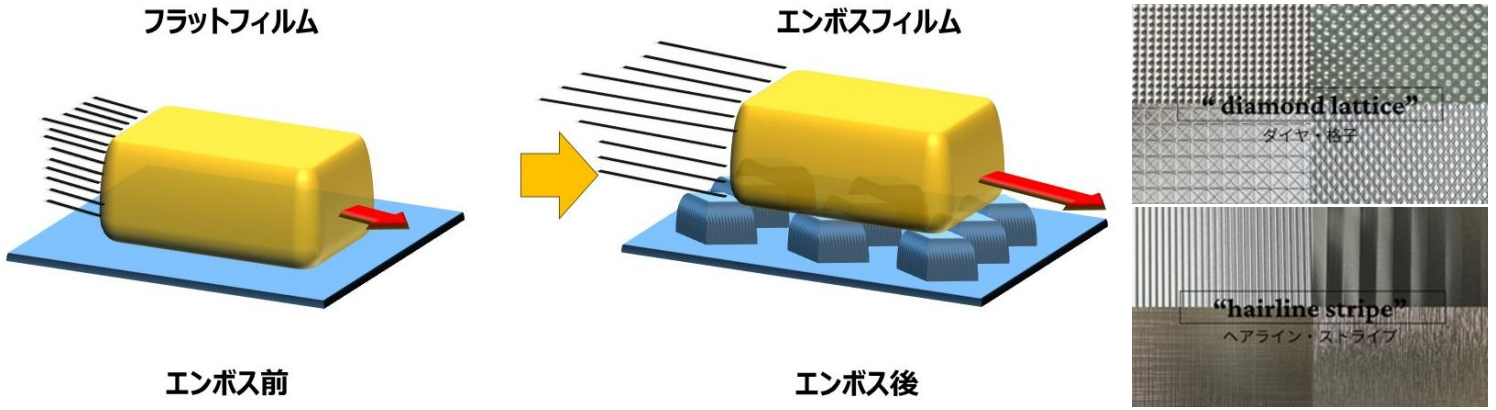
| Issue | Solutions Using Hard Embossed Films |
| --- | --- |
| The base material or other methods do not provide sufficient roughness, or fine adjustment of roughness is desired. | By embossing films that have been treated with sand-matte or coating-matte finishes, surface roughness can be increased and finely adjusted. |

Embossing achieves Ra (surface roughness) of 1.0 or higher!

# [Application 5] Improving Slip and Reducing Friction



By reducing contact area through embossed textures, friction with objects is minimized, enabling: (1) Improved slip performance of objects (2)Enhanced durability of the product surface


| | |
|---|---|
| Usage | ✓ Films for improving slip and preventing excessive adhesion in electronic component manufacturing processes<br>✓ Transfer films for adding slip properties to resin sheets<br>✓ Films for enhancing slip and preventing adhesion to make stacked films or objects easier to handle |



Embossed shape reduces contact area! Applications: Friction reduction and improved slip properties

# [Application 6] Creating Space and Preventing Adhesion



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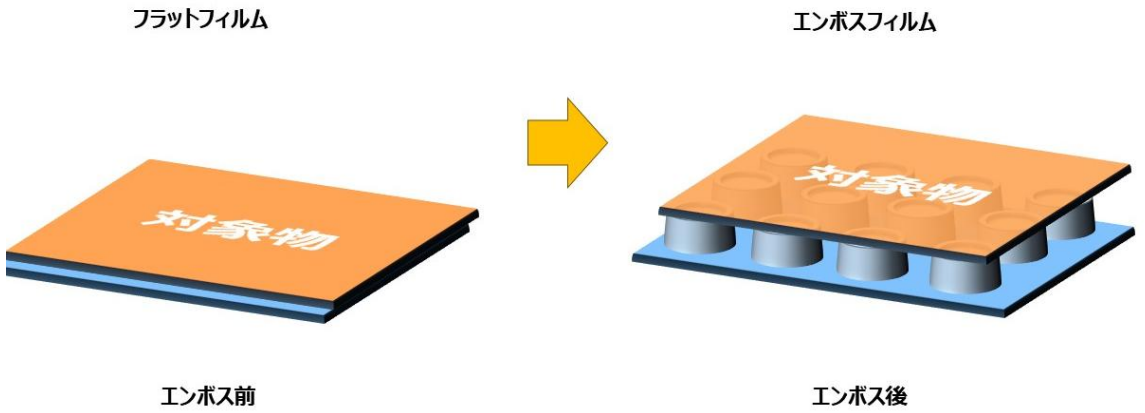
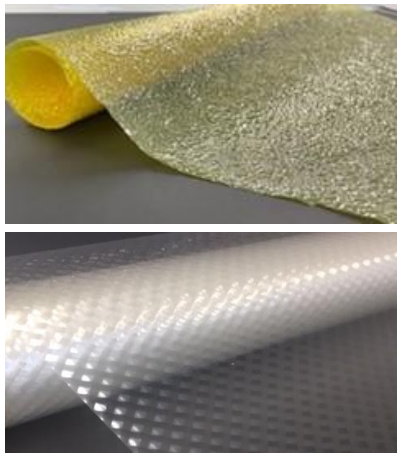
## Embossing high-rigidity films (such as PET) creates textured patterns with stiffness that generate space.

| | |
|---|---|
| Usage | ✓ Embossing polyimide films creates space, reducing material usage (cost).<br>✓ Used as interlayers in processes to prevent adhesion between films.<br>✓ Stripe-patterned embossed films help control liquid flow.<br>✓ Air layers formed by embossed textures provide insulation and condensation prevention.<br>✓ Can be used as spacers or cushioning materials. |

Creating space with embossed spacers. Adding space and air layers.

# Hard embossed films are environmentally friendly



Goudou

Hard embossing is a chemical-free process that does not use additives, making it an environmentally friendly option for textured films.


| | |
|---|---|
| Recommended Situations | ✓ When surface roughness (textures) is needed but residue, bleed-out, peeling, or slippage must be avoided.<br>✓ When release performance is required but silicone release films cannot be used.<br>✓ When you want to recycle the film as-is without separating the release layer.<br>→ Unlike standard release films, which require removal of the release coating, embossed separators can be recycled with the film material intact. |



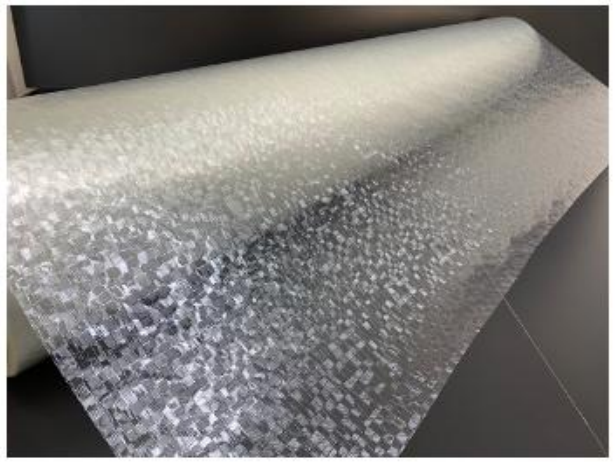
Embossing is an environmentally conscious processing method [Chemical-Free Process]

# Hard embossed films are environmentally friendly.

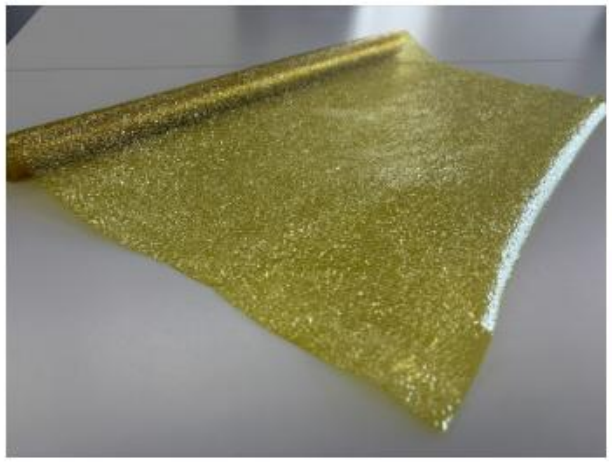


Goudou

Using high-rigidity, high-heat-resistant hard embossed films extends the service life of the films (reducing replacement frequency) and helps reduce plastic usage.

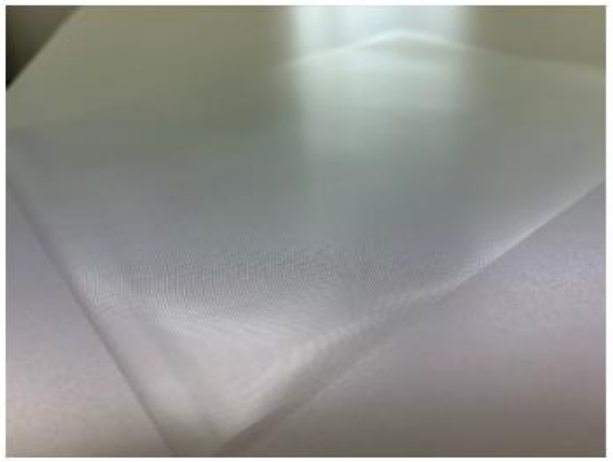


**BOPET**



**Polyimide**

**Polycarbonate**



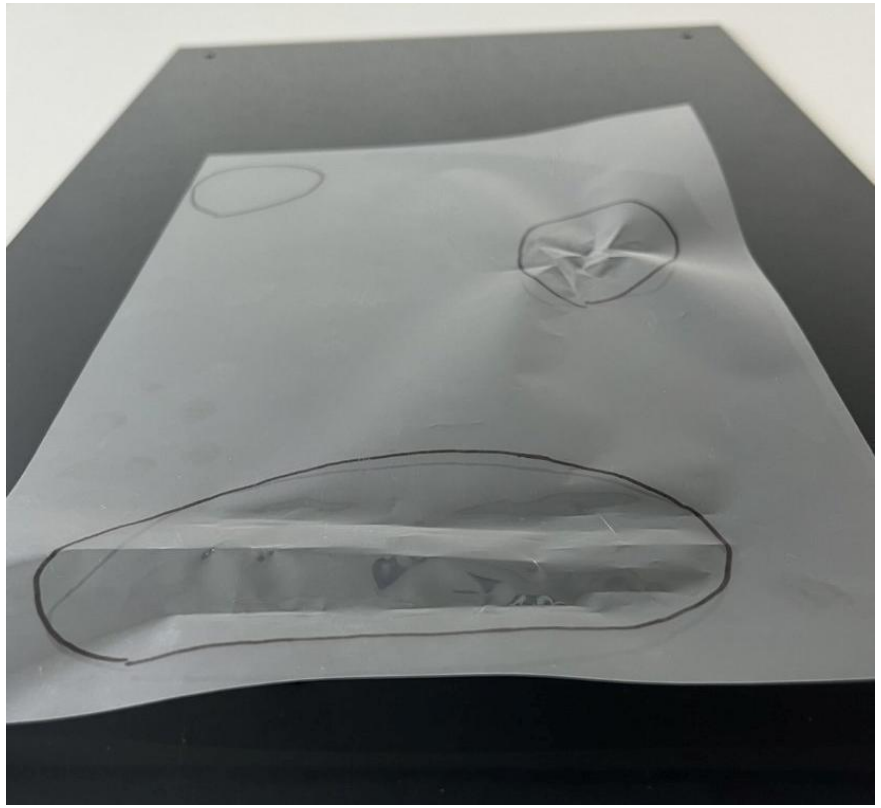
**PEN**

Benefits of Embossing

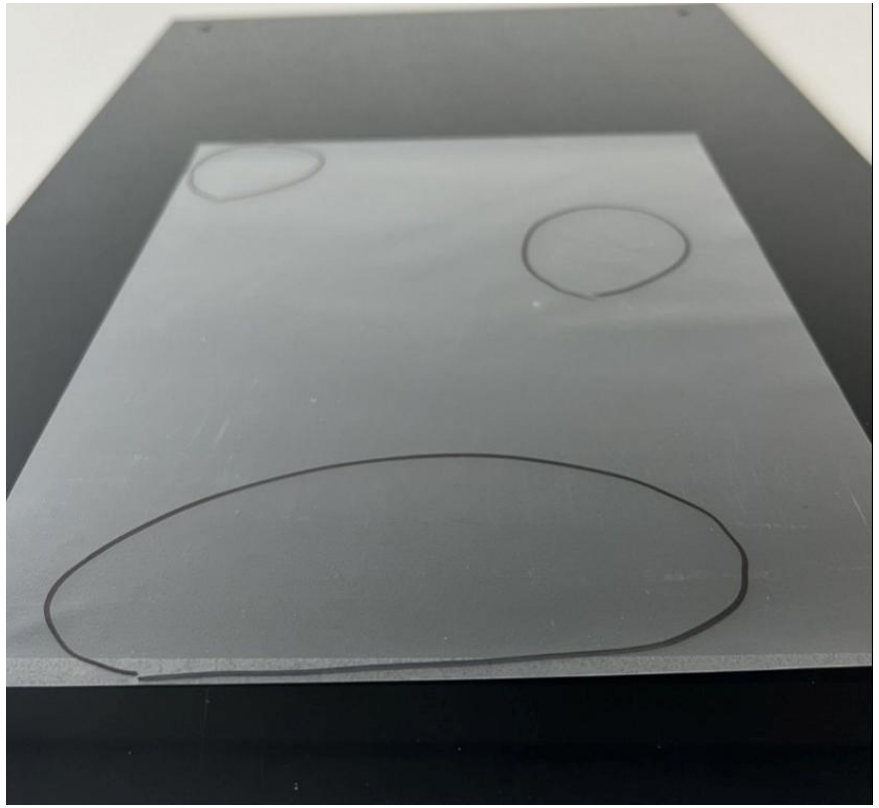
# Hard embossed films are environmentally friendly.



Films with folds, wrinkles, or dents can be processed and reused as embossed films.

Before embossing



After embossing

[Re-embossing (Recycled embossing)]

# Research and Development Support

We offer A4 samples, sell roll samples, and can accommodate small-lot prototyping. With over half a century of experience, we can propose suitable base materials, embossing patterns, and application methods.

## Annual Prototype Projects

**100 Projects**

**Highly Rated by Engineers & Developers**

We offer flexible solutions tailored to your needs

## Samples & Small-Lot Prototypes Available

Support from Early Development to Scale-Up

**A4 Sample**
For initial evaluation and verification

**Roll Sample**
For continuous processing and wide-width prototyping

**A4 Prototype**
Pattern formation on specified substrates

**Small-Lot (Small Roll) Prototype**
For pre-production verification


Hard embossed films are used across various fields and applications.
We introduce many examples on our website, so please take a look.
Feel free to contact us with any questions or sample requests!