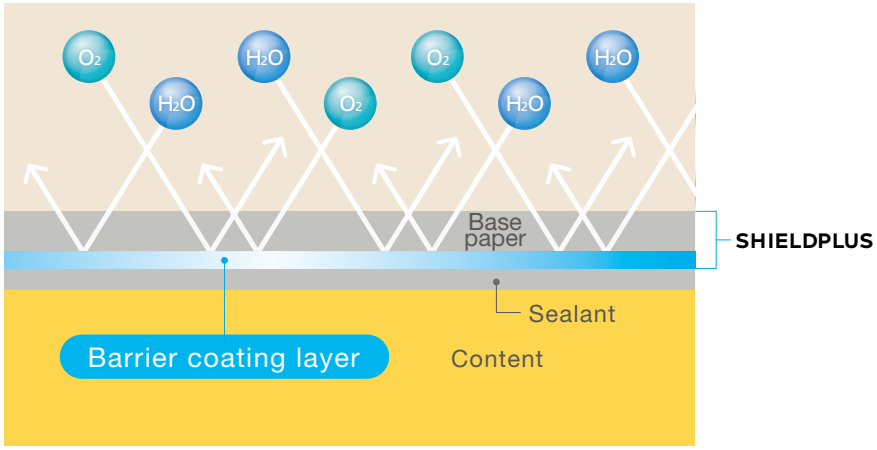
# What is SHIELDPLUS?

After it is produced, the content in a package, especially food, is gradually deteriorated chemically as time passes for reason of environmental changes. The package is therefore required to prevent permeation of oxygen and vapor and deterioration of commercial value of the content. It is also significant for the package to maintain the flavor of the content and to block outside smells from coming in.
We have developed SHIELDPLUS as an environmentally friendly paper-based barrier material by apply onto a base paper completely made of wooden material a barrier coating layer based on the water-based coating technology for papermaking.

## Material composition image




## Features

### Oxygen and vapor barrier properties

Superior barrier properties protect the content and maintain its quality.

### Flavor barrier property

The SHIELDPLUS maintains good flavors and blocks unpleasant smells. It also prevents odor from transferring.

### Friendly to the environment

Using a base material made of wood as renewable and recycled resources, SHIEDPLUS is excellent in environmental friendliness.

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# SHIELDPLUS PREMIER

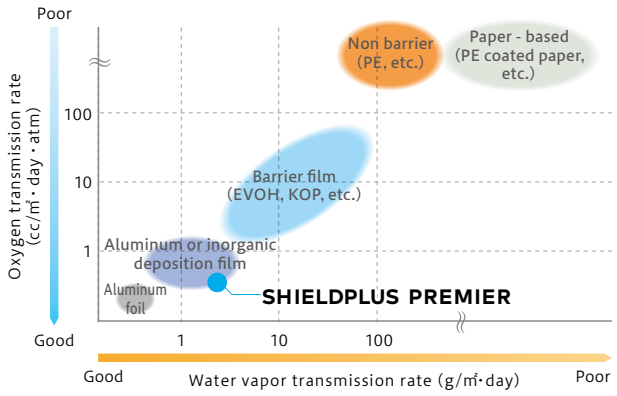
*Under development

It is a global correspondence product of SHIELDPLUS series.

## Performance

- **Excellent barrier properties (oxygen / water vapor barrier)**
  It protects contents and maintains quality with oxygen and water vapor barrier properties which are equivalent to various high barrier films such as aluminum vapor deposition film.

- **Flavor barrier properties**
  It maintains the fragrance of the contents and prevents smell transfer from the outside.




## Advantage

- Its base material is paper, which is renewable and recycled resources. It means that it is capable of reducing $CO_2$ emissions and other environmental impacts.
- If biodegradable film like PLA is used as a sealant, whole package material will be biodegradable.
- It does not hamper the use of metal detectors.
- It helps differentiate products by means of paper texture.
- A single layer of SHIELDPLUS PREMIER takes the place of a two-layer structure composed of a base material and a barrier film to eliminate the lamination process.

## Application

It may serve as an alternative to different kinds of barrier films, including a packaging material for various kinds of food, household items, cosmetics and industrial materials and a building material.

* We are ready to offer products suited for other applications as well. For details, please contact us.

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# SHIELDPLUS - An environmentally friendly barrier material

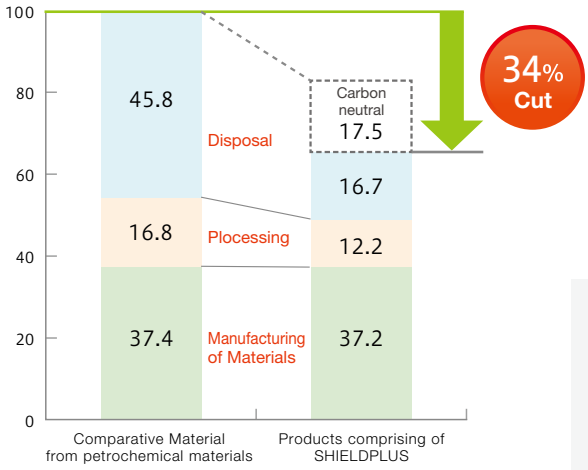
## Raw material: Renewable and recycled resources

SHIELDPLUS adopts paper as its base material, and paper is made of wood as renewable and recycled resources.
The Nippon Paper Group has established and now operates a system and a mechanism for continuously procuring renewable wooden resources.

Schematic of the harvesting cycle

## Product: A higher biomass content and lower $CO_2$ emissions

Use of SHIELDPLUS in place of plastic film will increase a biomass content of products and reduce $CO_2$ emissions.

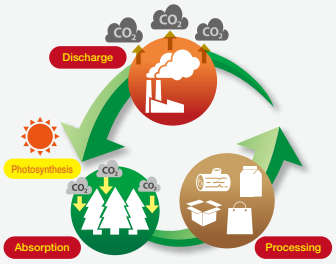



$CO_2$ emissions derived from fossil resources and SHIELDPLUS
(Relative value defined as “100” for comparative product)

1. LCA(Life-cycle Assessment)
   Assessment System / Evaluation of the process for raw material, papermaking, coating, lamination and disposal (incineration)
2. Assessment Method
   LCA software MiLCA (Japan Environmental Management Association for industry)
   [Comparative Material] Using MiLCA implementation data or the LCA JAPAN Forum DB
   [SHIELDPLUS] Using own data of operation
3. Composition of evaluated packaging material
   [Comparative Material] $OPP_{20\mu}/EVOH_{12\mu}/LLDPE_{25\mu}$
   [SHIELDPLUS] $SHIELDPLUS_{60g/m^2}/PE_{30\mu}$

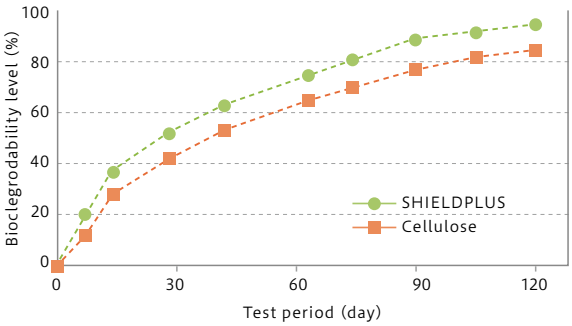
### Carbon neutrality

Trees absorbs carbon dioxide in the atmosphere while they grow. Carbon neutrality refers to a concept according to which $CO_2$ emissions resulting from burning of wooden resources are offset by the amount of $CO_2$ absorbed in the phase of growth and not counted as an increase in the $CO_2$ level in the atmosphere.




## Disposal: Biodegradable

SHIELDPLUS is biodegradable like cellulose.




1: Test conditions
JIS K 6955:2006 (ISO 17556:2003)
Plastics - Determination of the ultimate aerobic biodegradability of plastic materials in soil by measuring the oxygen demand in a respirometer or the amount of carbon dioxide evolved

2: The data are courtesy of the Chemicals Evaluation and Research Institute, Japan

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# Frequently Asked Questions

## Printability

- In the case where the SHIELDPLUS is used as a wrapping material, its surface with barrier coating contacts the content. The outer surface can be printed in a conventional manner that takes advantage of the paper texture.

- The surface with the barrier coating can be printed in different methods, including gravure printing, flexographic printing and UV offset printing.

## Processability

- SHIELDPLUS is compatible with different types of lamination. For processing in the extruding lamination method, it is recommended to use an anchor coat.

- SHIELDPLUS can be processed with general-purpose bag making machines and forming machines. It means that the material is applied for different kinds of soft packaging, paper cups, various paper containers and more.

## Selection of base paper

- The barrier property is added by coating. This method can be applied to a wide variety of base paper materials.

*For details, please contact us.

## Food safety and hygiene

- SHIELDPLUS conforms to the Ministry of Health and Welfare Public Notice No. 370.

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