

A huge volume of fruits and vegetables discarded without being eaten due not to be kept freshness are reduced, and the plastic that are thrown away without properly treated can be decomposed. "Apinonn Keeper®" creates a society with less waste that benefits people and the earth.

Apinonn Keeper®

Current challenges on distribution

- a) Airfare for fruits and vegetables is 10 to 20 times higher than sea freight.
- b) Since sea transportation takes long-time, the burden of refrigeration costs is high.
- c) Damages are always likely to occur due to shocks and heat shocks during air, sea and land transportation. Once damages occur, the release of ethylene gas increases acceleratingly and the loss increases.



Keep quality stably during long-time sea transportation



Disassemble packaging material waste transportation

Keep freshness by using Apinonn Keeper® for packaging and cushioning materials

Can attach freshness-keeping effect to resin products (packaging and cushioning materials, racks etc.) used for fruits and vegetables.



After use, oxidative degradation promoted by sunlight and heat to reduce the molecular weight.

Add additives that repeat oxidation and reduction to non-degradable plastics such as PE and PP. Promote oxidative degradation, lower molecular weight and facilitate decomposition by microorganisms



Microorganisms return oxidatively decomposed plastic to nature

Low molecular weight plastic is further decomposed by microorganisms in the soil and compost, converted into CO2 and H2O, and returns to nature.



World official certificates



Sweden Hong Kong



UAE (United Arab Emirates)



Brazil Saudi Arabia

Can be processed into any plastic product

• Possible to put a biomass mark.



• Possible to make 100% plant-based products using green polyethylene.



アピノン キーパー®
Apinonn Keeper®

Functional Plastic
Biodegradable
Freshness-keeping Packaging Series

Freshness-keeping

Biodegradation



More Device

More Device Co.,Ltd.



**Distribution Revolution[®]
by Keeping Freshness**

**Environmental Conservation
by Biodegradation**

ETHYLENE GAS CONTROL
& MOLD SUPPRESSION

Apinonn Keeper[®]
アピノンキーパー[®]

Biodegradable Freshness-keeping

Advanced technology

**Coexistence of biodegradation
and freshness-keeping**

**World's First
Official Certification**

Obtained the world's first official certification of oxidative biodegradation in Sweden



The biodegradable Apinonn Keeper[®] has the function of converting polyolefin resins (non-degradable plastics) such as polyethylene and polypropylene, which are difficult to biodegrade, into oxidized biodegradable plastics.
(Official certification obtained. US patent No.6,482,872)

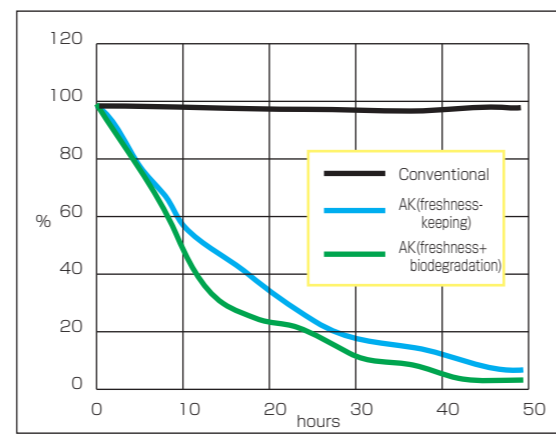
Oxidized low molecular weight products formed by redox are digested and absorbed by microorganisms in the soil, and are finally converted to CO₂ and H₂O by metabolic activities such as respiration.

Apinonn Keeper[®] can add the biodegradation effect to all products. Biodegradable plastic that can keep freshness ... Ideal packaging material.

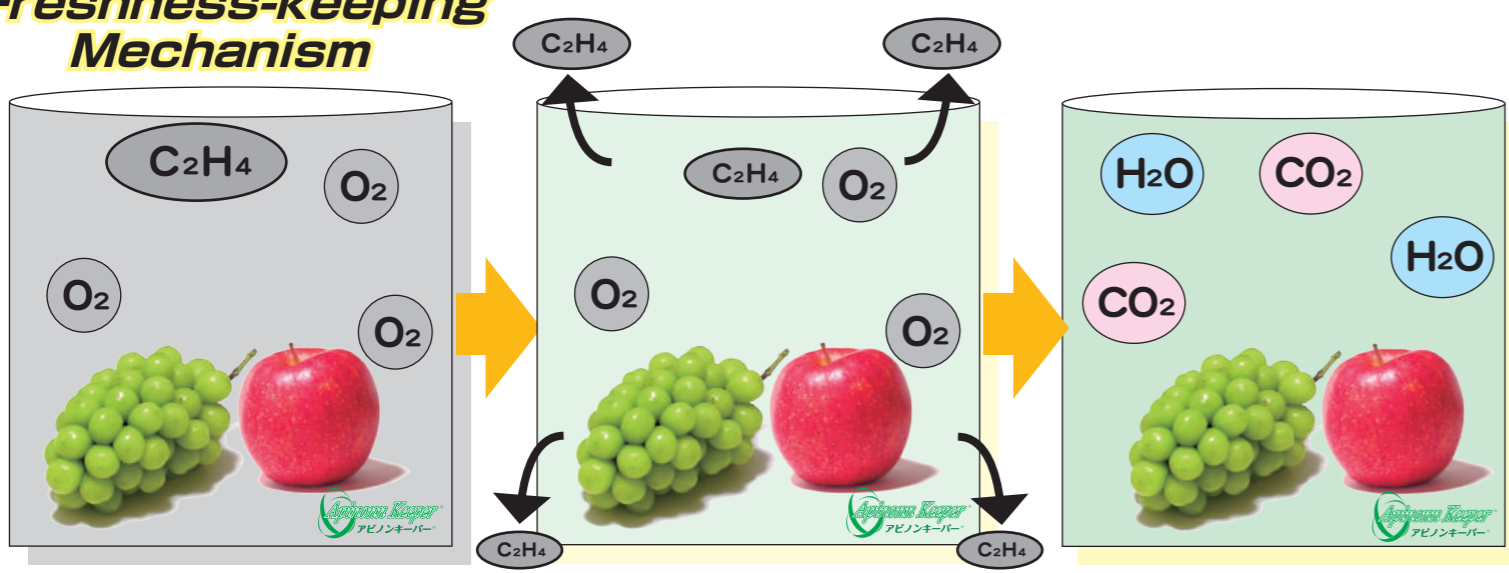
Control Ethylene Gas to Keep It Fresh !

Freshness-keeping technology for fruits and vegetables by ethylene gas control

Fruits and vegetables produce ethylene gas, which is a deterioration-promoting substance. Apinonn Keeper[®] discharges ethylene gas out of the bag and decomposes the remaining gas in the bag into carbon dioxide and water to suppress the deterioration and keep freshness. When combining freshness-keeping and biodegradation functions, freshness-keeping function further improves due to "HYBRID EFFECT". Changes in ethylene gas remaining rate ▶



Freshness-keeping Mechanism



Ethylene gas released from fruits and vegetables and oxygen in the bag promote decay.

Discharge the ethylene gas accumulated in the bag out of the bag.

Ethylene gas remaining in the bag is decomposed into carbon dioxide and water. Antibacterial agent suppresses mold and bacteria.

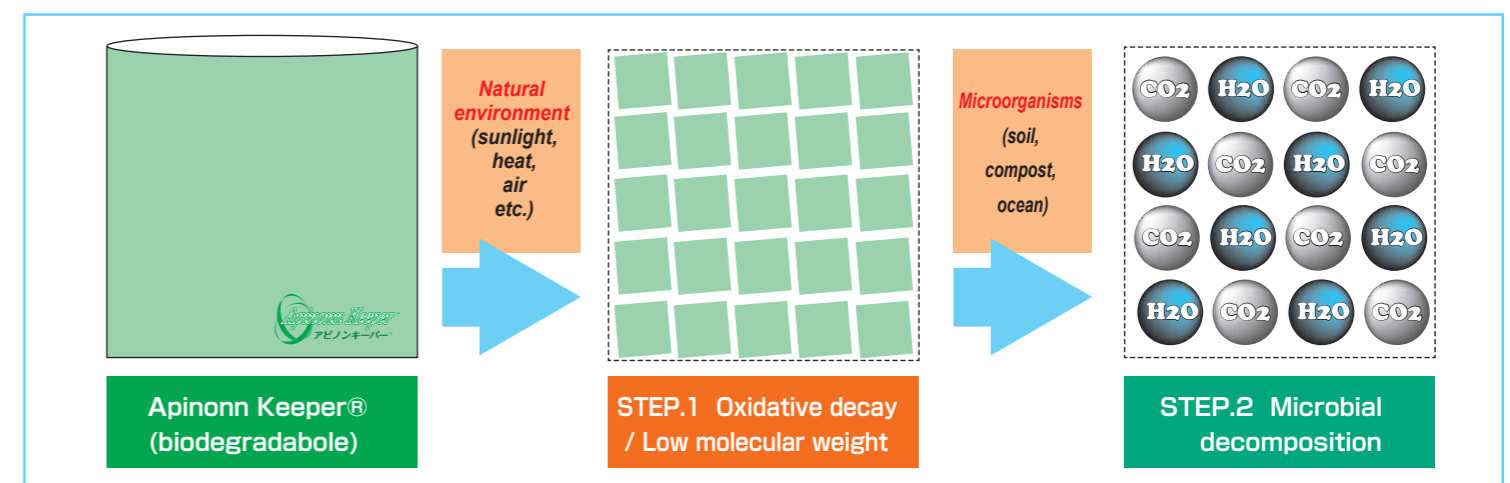
Mechanism of Oxidative Biodegradation

STEP.1 Oxidative decay / Low molecular weight

A catalytic reaction (radical reaction) is triggered by using natural light, heat, etc. as an energy source, and oxidative decomposition of the polyolefin polymer begins. Biodegradable additives cause repeated redox and reduce physical properties and molecular weight.

STEP.2 Microbial decomposition

Oxidized low molecular weight products formed by redox are digested and absorbed by microorganisms in the soil, and are finally stored in the body of microorganisms as biomass, and are converted to CO₂ and H₂O by metabolic activities such as respiration.



Marine Plastic Biodegradation Test



Plastics that have been reduced in molecular weight by the light and heat of the natural environment sink to the seabed due to oxidation, so biodegradation by microorganisms progresses.

Possible to control the product life and decomposition rate by the amount added.



Biodegradation Field Test



Advantages of Oxidative Biodegradation!

- OSmall amount of additives does not affect the physical properties (hard / soft) → Good cost performance
- Odecomposition does not start even in a humid environment → Inventory is possible



Expected to be used in agriculture as well