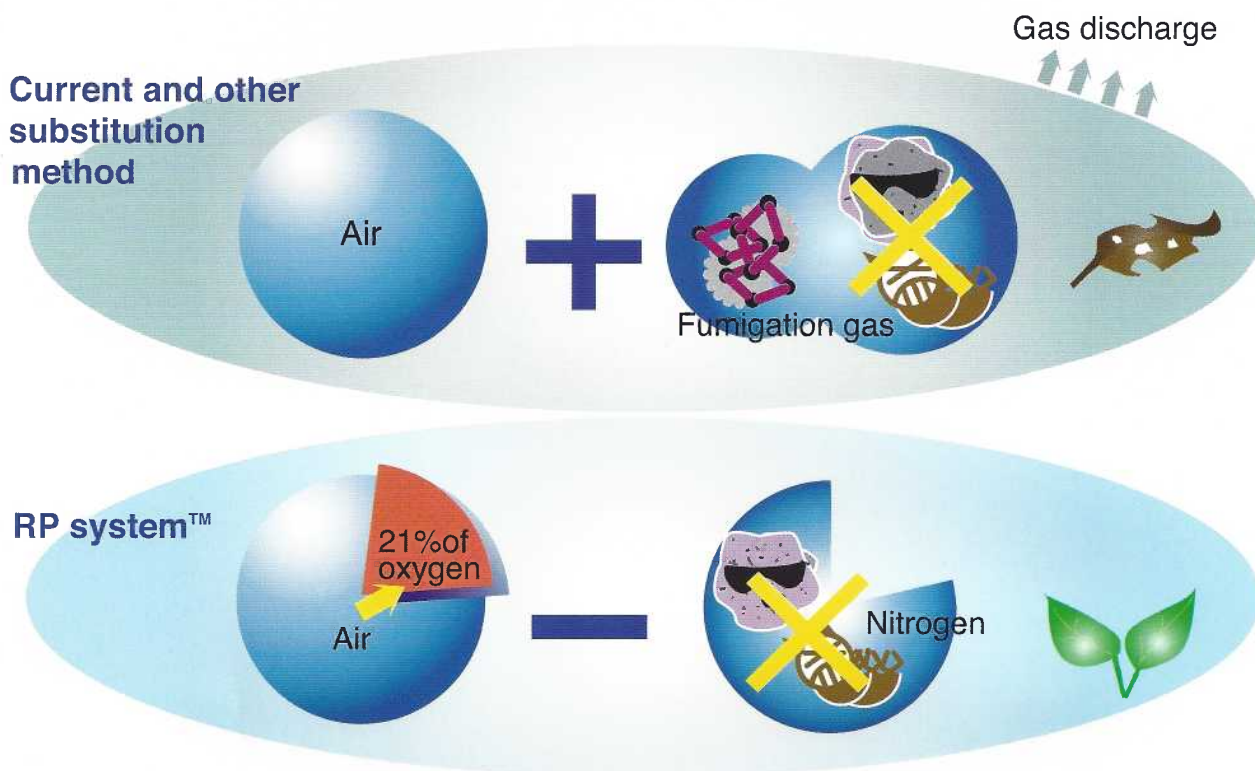


Preservation solution for
cultural properties

RPTMSystem

Revolutionary Preservation System

① Features of RPSystem™



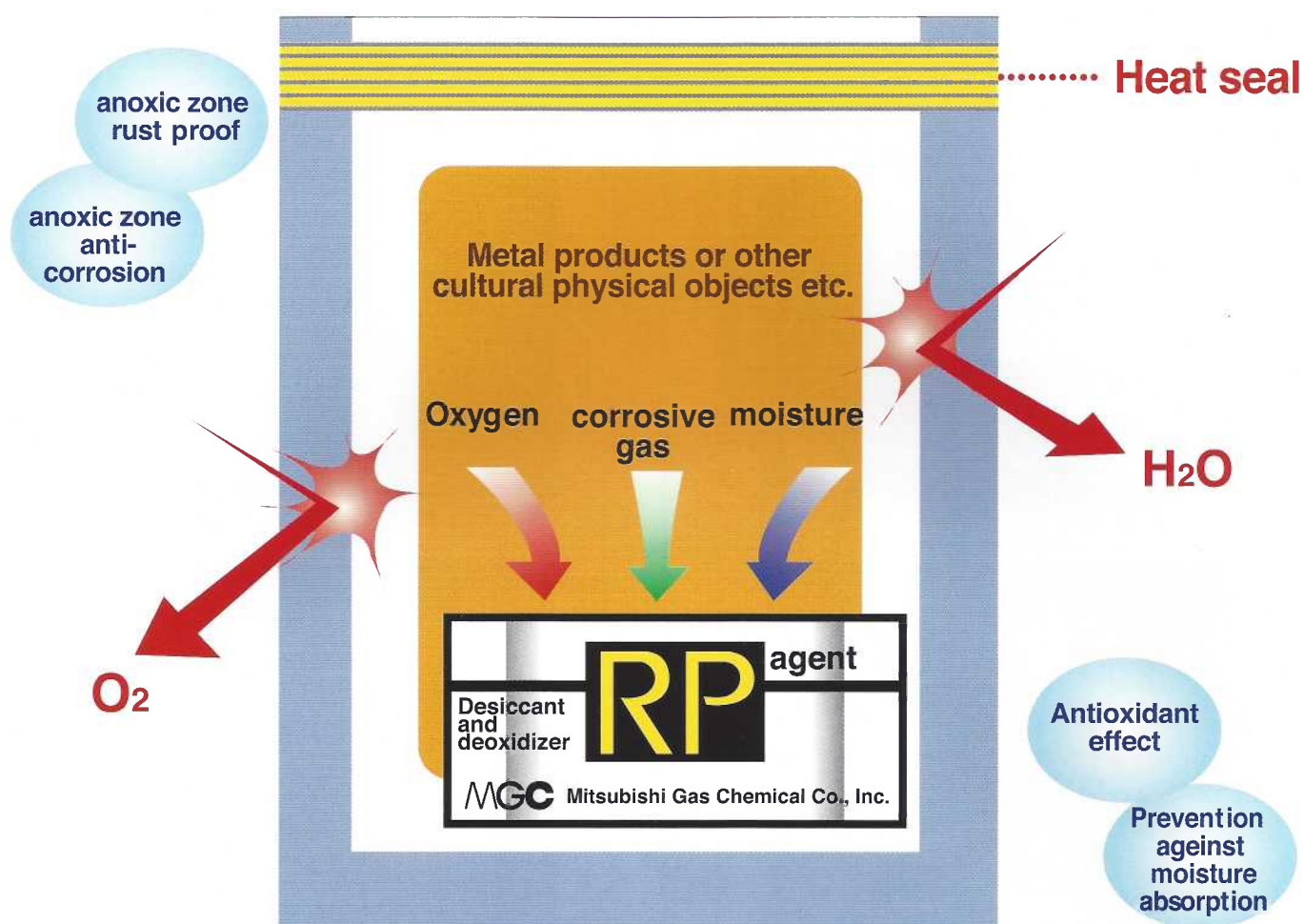
Concept of RP system

- RP Agent absorbs Oxygen, Corrosive Gases and Moisture (A type only) in Air-tight packaging. It creates best condition for cultural properties to prevent from deterioration such as oxidation, deterioration, bugs attack. In addition, let mildew resting.
- RP system is applicable for museums, galleries, libraries, archives, cultural properties and so on. It does not require large-scale equipment for gas-fumigation but a heat-sealing machine only.

AIR-G, Automatic Relative Humidity Controlled Nitrogen Generator is available. It is to treat big cultural properties, up to approx. 3m³. For further information, please ask your distributor.

Contents

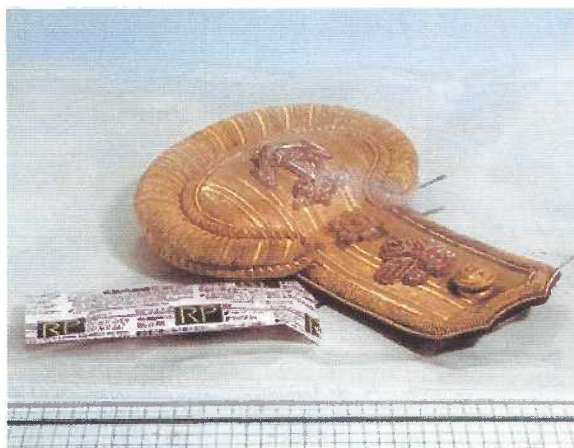
① Features of RP System	1	⑥ Oxygen Indicator	6
② Application Examples of RP System	3	⑦ Packagig Design	7
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- RP system consist of RP agent(Oxygen absorber), and high gas barrier bag such as ESCAL PTS and aluminum bag. ESCAL is the one of the highest gas barrier and transparent film in the market.
- RP-A type absorbs oxygen, moisture and corrosive gas causing metallic corrosion and is for metallic cultural properties. Especially, it is able to stop collapse of excavated metal-works.
- RP-K type absorbs oxygen and corrosive gas but not moisture. RP-K is to treat and to preserve nonmetallic cultural properties such as wood, paper, fabric, leather, and so on. It is effective in insect proof and dust control of physical objects.
- Gas barrier film has gas-barrier effect which transmit hardly any oxygen and moisture vapor. In addition, it is reduced additives as much as possible in order to avoid contamination.

② Application Examples of RPSystem™

RP-A type (metal-warkings)



- Excavated Hardware
- Archaeological Iron
- Medal
- Coin
- Cutlery
- Metal Ornament
- Sword

RP-K type (nonmetal)



- Book
- Historical Materials
- Hanging Picture
- Map
- Textile
- Pearl
- Clothes

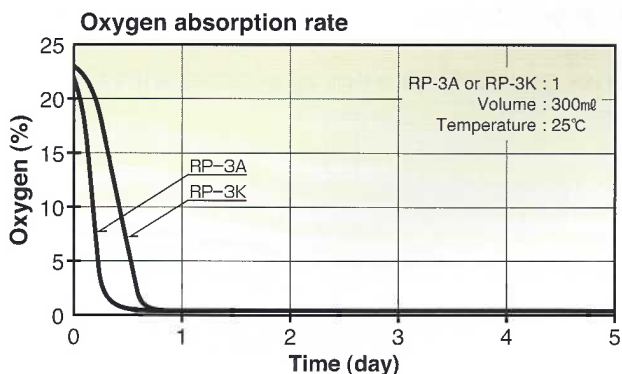
③ RP Agent

○ Functions of RP Agent

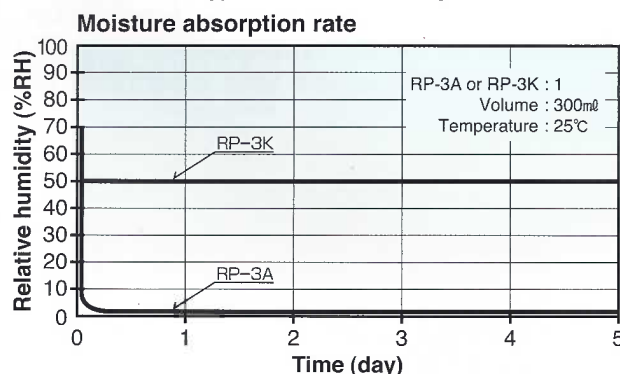
When a specified amount of RP agent is sealed up in an appropriate barrier bag:

* Common to A and K types.

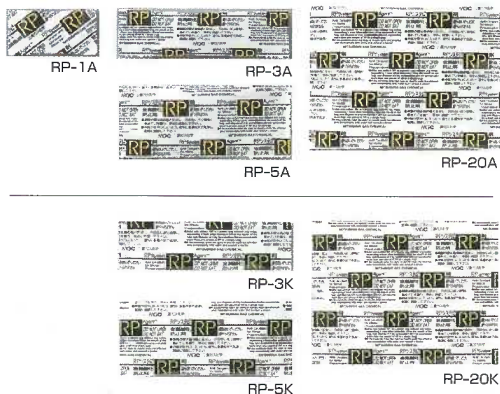
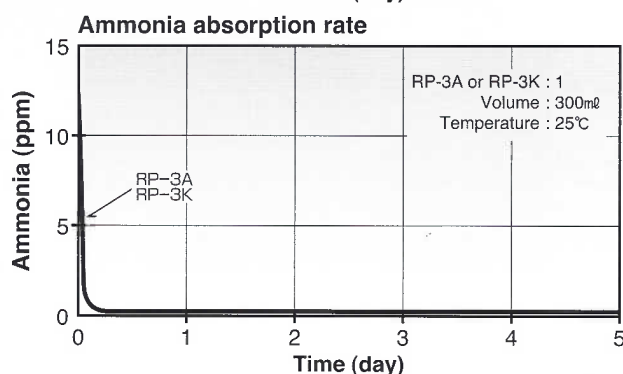
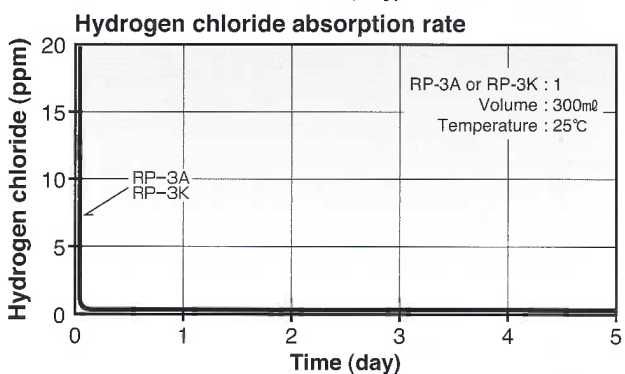
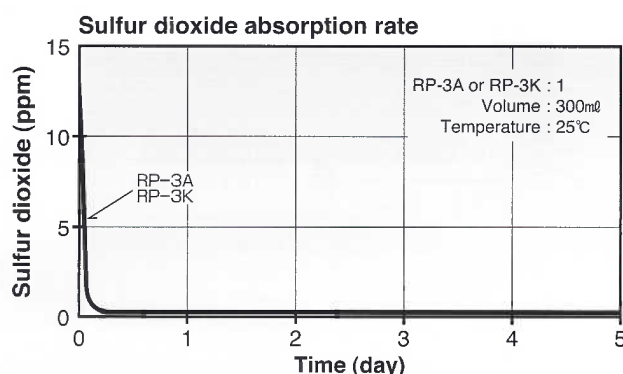
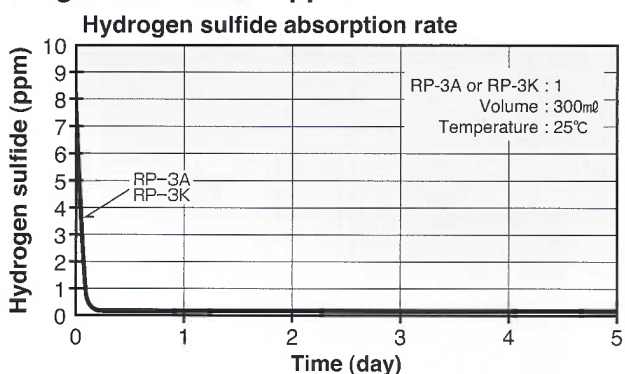
① The oxygen concentration falls below 0.1%.



② With the A type, the relative humidity falls below 10%; with the K type, the initial humidity is maintained.



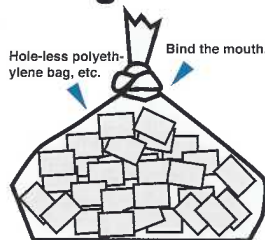
③ The concentration of each kind of corrosive gas falls below 1 ppm.



Disposal of RP agent

If you dispose of a large amount of RP agent, distinguish it from other wastes, collect it in a polyethylene bag, etc., and burn it with the bag after sealing up the mouth as close as possible.

(RP Agent may be deposited in a landfill in accordance with all federal, state and local regulations. RP Agent is not considered a hazardous waste under current RCRA regulations.)



Notes

- Do not break the pack of RP agent to leak its content. In the case where it accidentally enters the eye or mouth, wash immediately with a large amount of water and then ask doctor for treatment.
- RP agent which has been used once can not be used again. When you unseal the package of the RP System and seal it again, it is necessary to replace the RP agent and enclose a new one.
- Do not leave a large amount of RP agent in the air. It may generate heat due to chemical reaction.

4 Gas-barrier Bag

- “ESCAL” is made of a special film which prevents migration of oxygen, moisture and other gasses.
- “ESCAL” is a tube sealed on both edges, and supplied in a roll.
- “ESCAL” has a white band provided for data entry.
- For a large object, use the master roll of film, “ESCAL FILM” or the large bag, “ESCAL GUSSET”.
- The preservation period obtainable with “ESCAL” is approximately 5 years.
- The 3-way sealed bag, “PTS bag”, is also available for short-term storage, up to a year.
- Gas-barrier films used to wrap food (EVOH, PVDC, etc.), which have a high permeability, are not applicable for the RP System.
- A vinyl or polyethylene film, which has poor gas-barrier property, are not applicable with the RP system.



ESCAL



ESCALgusset



ESCAL film



PTS bags

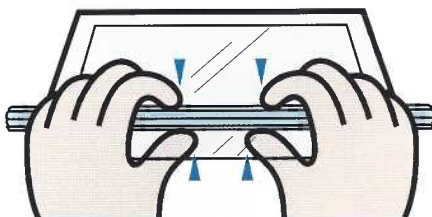
◎Performance comparison of gas-barrier bags (ref. values at 25°C, 60%RH)

Suitability	Type	Oxygen permeability (ml / m ² -day-atm)	Water vapor permeability (g / m ² -day-atm)	Remarks
◎	ESCAL	0.05	0.01	Ceramic-evaporated transparent film
○	PTS	0.5	0.08	Same as above
○	Aluminum (foil)	<0.01	<0.01	Not transparent
△	Aluminum (deposited)	0.2 to 6	0.5 to 6	Same as above
×	EVOH series	0.3 to 7	4 to 7	EVAL, OV, etc.
×	PVDC series	5 to 15	4 to 7	Polyvinylidene coat (KOP, K nylon, etc.)
×	Nylon series	30 to 120	5 to 15	
×	Polyethylene	>2000	5 to 15	

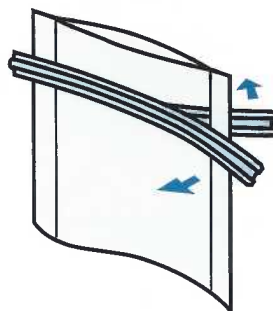
5 RPClip

This is a clip to seal up a gas-barrier bag easily instead of using a thermal seal.

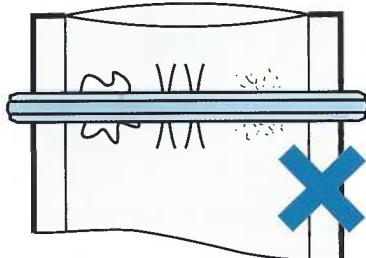
- Unfasten the clip to shut the mouth of the bag, and press the clip evenly from both sides with fingers.



- Remove the clip by pulling it out to both sides at one end.

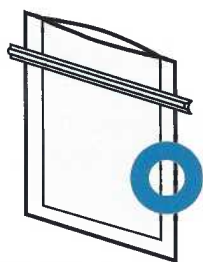


- Make sure that there is no foreign matter such as powder or label inserted in the clip. Do not wrinkle the film.

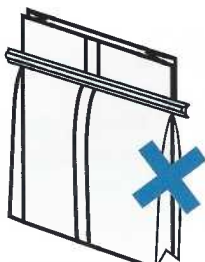


Notes

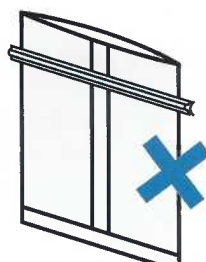
- Temperature range for use: Around the room temperature.
- After shutting and opening the clip repeatedly, it may not be possible to create a completely sealed condition.
- Gusset bags, back-sealed bags, etc. cannot be sealed up.



3-edge sealed bag



Gusset bag

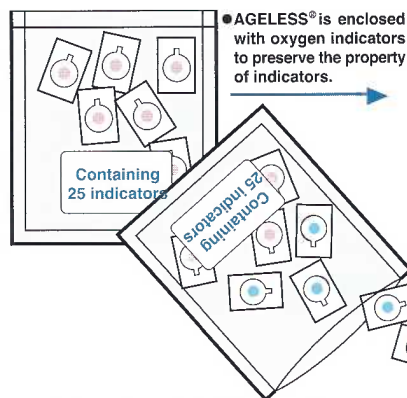


Back-sealed bag

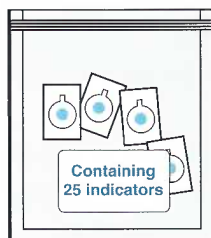
6 Oxygen Indicator

This is an indicator which changes color and shows whether a film is sealed up securely and whether an oxygen-free condition is created in the package. Enclose an indicator(s) in the package as needed.

How to use the oxygen indicator

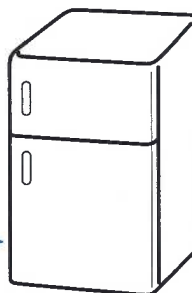


- AGELESS® is enclosed with oxygen indicators to preserve the property of indicators.



- If you take out a necessary amount of indicators, immediately put the remaining indicators back in the bag, seal the bag up, and then store in the refrigerator.

- Seal the extracted oxygen indicator(s) up in the ESCAL together with the RP agent.

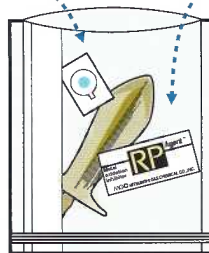


Seal up and put in the refrigerator.

- The indicator, in contact with oxygen, turns blue, and becomes pink again after the oxygen concentration in the package has fallen below 0.1%.

- ★ Form the above, you can check;
 - ① that the package is sealed properly;
 - ② that no pinholes etc. have been formed; and
 - ③ that the amount of the enclosed RP agent is proper.

Namely, you can find out whether the object is sealed properly with the RP System.



Just put in the package.



Seal up.

- A handy portable sealer is also available. [ClipSealer: C-200RN]

*This is not in the product line of Mitsubishi Gas Chemical Co., Inc.

- Use a thermal sealer for sealing the package. The desired performance is only obtainable through complete sealing. Preferably, use a sealer of doubleheating type that allows a sealing width of 10mm or more. You can also use a clip instead of a sealer.



Type	C-200RN
Specification	
Electricity	100V-60W×2 sheets
Seal size	200L-15W (mm)
Tooth form	2 ^m /m pitch, horizontal
Weight	Sealer 1.1Kg Controller 80g

Notes for Use and Storage

- Temperature range for use
 - Around room temperature. At low temperatures, it takes time to turn pink even when in an oxygen-free condition.

Repeated use

- Indicators can not be used repeatedly.

Storage condition

- If indicators are subjected to such conditions as sunlight (ultraviolet rays), oxygen, a high temperature above room temperature, and extreme desiccation, then their discoloring performance may decline. Seal them up together with the accompanying AGELESS®, then store in the refrigerator.

Validity as an indicator

- The oxygen indicator is for checking the oxygen-free state at the initial state of packaging. If it is left in the light or at a high temperature for a long period of time, its original pink fades into more neutral shades of color.

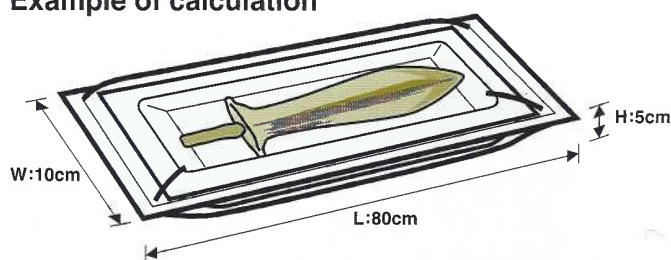
7 Packaging design

The amount of RP agent to be enclosed can be determined by actually putting an object in the ESCAL and then by calculating the air volume in the package.

Calculating formula for preservation of metal cultural assets:

$$\text{Air volume (ml)} = \frac{\text{Total volume of the bag with the content (ml)}}{\text{Specific gravity of the content}} - \frac{\text{Weight of the content (g)}}{\text{Specific gravity of the content}}$$

Example of calculation



$$\text{Total volume (ml)} = W(\text{cm}) \times H(\text{cm}) \times L(\text{cm})$$

Weight: 1600 g

Specific gravity: 4

$$\text{Total volume} = 10 \times 80 \times 5 = 4000 \text{ ml}$$

$$\text{Air volume} = 4000 - (1600 \div 4) = 3600 \text{ ml}$$

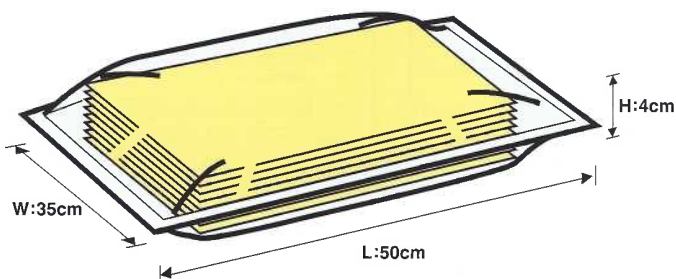
Use 2 packs of RP-20A

- For total volume, estimate a square shape out of the bag; then, use a ruler to measure the rough length, width and height (unit: cm).
- For weight, measure the bag and all. For specific gravity, only a rough estimate needs to be obtained. (Ref.: Iron 7.9, copper 8.9. Obviously, an object rusted all over results in a low specific gravity. If you have difficulty in calculation, you may ignore the volume of the contents.)
- Enclose 2 packs of RP-20A for air volume of up to 40; 3 packs for up to 60; and so on.

Calculating formula for preservation of nonmetal cultural assets

$$\text{Air volume (ml)} = \frac{\text{Total volume of the bag with the content (ml)}}{\text{Specific gravity (} \div 1 \text{)}} - \frac{\text{Weight of the content (g)}}{\text{Specific gravity (} \div 1 \text{)}}$$

Example of calculation



$$\text{Total volume (ml)} = W(\text{cm}) \times H(\text{cm}) \times L(\text{cm})$$

Weight: 1000 g

$$W \times H \times L = 35 \times 50 \times 4 = 7000 \text{ ml}$$

$$\text{Air volume} = 7000 - 1000 = 6000 \text{ ml}$$

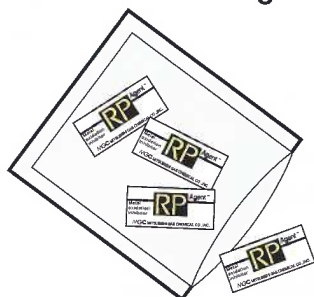
Use 3 packs of RP-20K

8 Work Procedures for RPSystem™

Before working

When tearing the aluminum bag open, take care not to damage the inner aluminum bag or the RP agent.

Do not leave the RP agent in the air.



① Take out the necessary amount of RP agent.

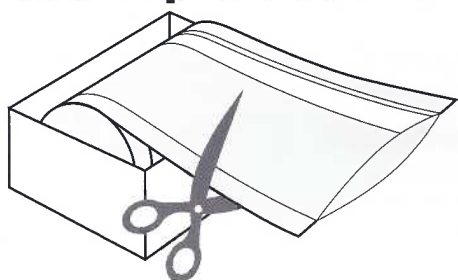


② Before you proceed, seal up the aluminum bag that contains the unused RP agent. (Expel air from the bag as much as possible; then, securely seal so that the sealed line does not make any wrinkle.)

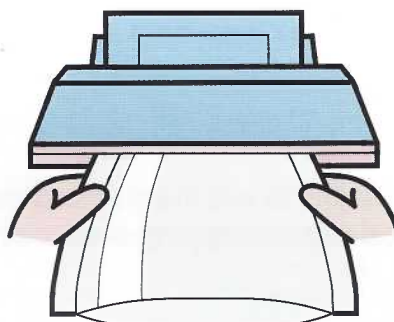


③ Seal up the RP agent taken out, within 30 minutes.

Work procedures



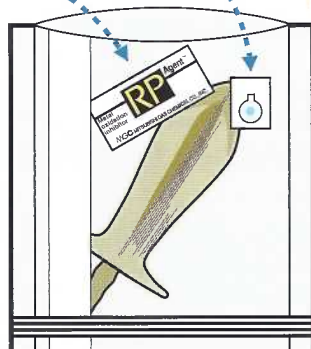
Cut the ESCAL into as many pieces as necessary.



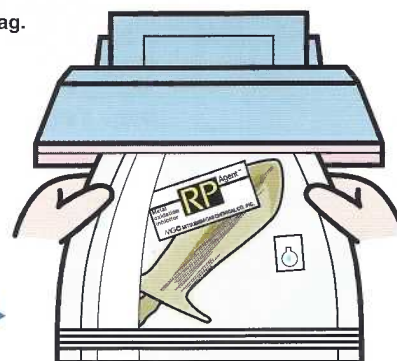
Seal one end to make a bag.



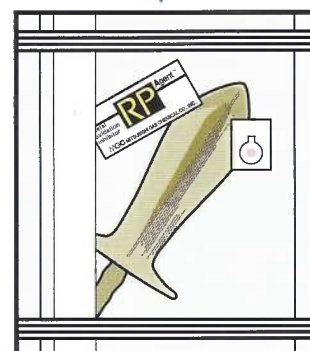
Seal up immediately.



Put the excavated item, the RP agent and oxygen indicator in the ESCAL.



Seal the ESCAL up with the sealer.



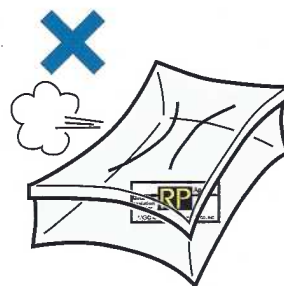
Final view

- Dry the object well before packing.
- Use a polyethylene bag or cushioning material to wrap object before packing, when you want to pack an object having projection or fragile item.

9 Q&A

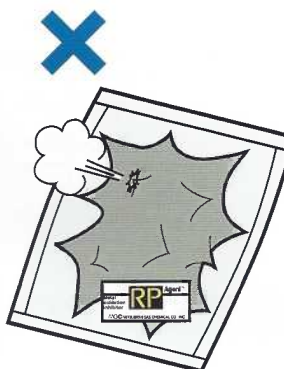
Q1 — **Is it possible to preserve using only a hard container with RP agent enclosed?**

A1 — No, it is not practical under present circumstances.
If you use a plastic hard container alone such as Tupperware, the pressure inside the container is reduced due to the oxygen absorption by the RP agent. This causes the deformation of hard container, and consequently some air gets into container.
If you want to use a hard container, cover it with gas-barrier bag sealed perfectly.



Q2 — **How should we preserve an object with projections?**

A2 — The RP system requires a completely sealed condition, which means you cannot obtain the desired preserving effect if a projection has made a pinhole on the gas-barrier film. To protect such projections, wrap up the object by plastic cushioning materials such as a tray and bubble wrap sheet prior to RP-packaging.
However, do not use paper cushion when using the RP-A agent which is moisture absorption type. Because the RP-A agent also absorbs moisture from inside of the paper cushion. So the moisture absorbing ability of the RP-A agent may be exerted wastefully and also the paper cushion itself may deteriorate due to excessive desiccation.



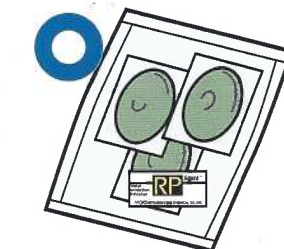
Q3 — **Is it possible to use in combination with a paulownia case, a folded paper-wrapping or something like that?**

A3 — Yes, it is, if you use the RP-K agent which we call moisture-neutral type.
If using a paulownia case, put suitable amount of RP-K agents, respectively, inside and outside the case, and then put the case in a bag, finally seal up the package.
If you want to use a folded paper-wrapping case, pack the case with the RP-K agent placed between the case and the gas-barrier bag. Yet, you cannot use the RP-A agent of moisture absorption type.



Q4 — **Is it possible to use for two or more objects each packed in a polyethylene bag for classification?**

A4 — Yes, it is.
If you pack two or more objects collectively – each packed in a polyethylene bag – an oxygen-free condition will be created in each polyethylene bag in a few days, since a polyethylene bag itself has a high permeability.



Q5 — **Is it necessary to degas(vacuum-pack) the package with an RP agent enclosed?**

A5 — No, it is not necessary.
If you try to degas the package with an RP agent enclosed, the package will be decompressed further due to oxygen absorption, which causes the object to contact the inner surface of the gas-barrier bag too closely. When sealing the package, you must guard against this condition. Otherwise, the object may be damaged or a pinhole may be formed on the inner surface of film due to excessive pressure from outside.

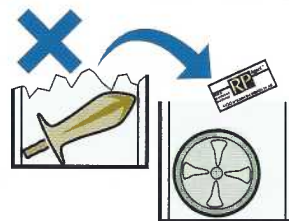


Q6 ————— **Is it possible to reuse the RP agent like a silica gel?**

A6 ————— No, it isn't.

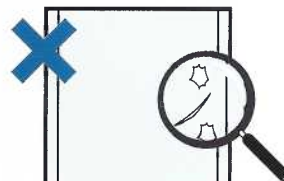
The RP agent cannot regenerate its preserving ability. The silica gel may physically retain moisture and emit it by drying. In contrast, the RP agent absorbs oxygen, corrosive gas and moisture by irreversible chemical reactions.

(The RP-K agent does not absorb moisture.)



Q7 ————— **Is it possible to reuse the ESCAL or the PTS bag?**

A7 ————— Yes, it is possible if there is no flaw, fold, pinhole, etc. in the film. However, the RP system requires a completely sealed condition, which means the desired preserving effect cannot be obtained if a scar or hole is on the surface of gas-barrier film.



Q8 ————— **Is any harmful substance used in the RP agent?**

A8 ————— No, it isn't.

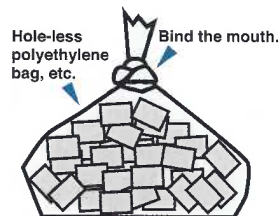
We make both the RP agent and the oxygen indicator from non-toxic ingredients. However, don't eat them, nor tear RP agent pouches, intentionally.



Q9 ————— **How should we dispose of the RP agent?**

A9 ————— If you dispose of a small amount of RP agent, throw away as "general plastic wastes".

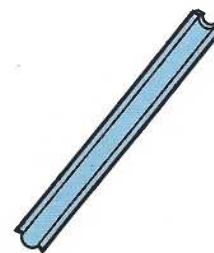
If you dispose of a large amount of RP agents, separate RP agent pouches from other disposal items in an air tight plastic bag (for example, a polyethylene bag.), tie the mouth of the bag with as little air left inside as possible, and keep it away from other materials until incinerating it at the earliest opportunity. Because, a large amount of RP agent will generate heat as a reaction of oxidation, when the agents are accumulated together.



Q10 ————— **Which considerations are important when using the clip?**

A10 ————— We have already confirmed that the clip can maintain a fully sealed condition for more than 4 years in a state in which the RP system is left at a room temperature.

However, if a thin film is fastened with the clip that has clipped a thick film for a long period, the clip may come loose and consequently cannot attain complete sealing. To determine if a clip holds the desired sealing ability, clip a single piece of film and try to pull it out. If you fail, the clip can be considered to be acceptable. Also, the clip cannot attain the desired sealing condition at a temperature of 40°C or higher.



Q11 ————— **How long can unused RP agents remain effective?**

A11 ————— No functional deterioration takes place as long as air is not let in. Accordingly, be careful not to make any scar or hole in the external film.

If you do not use the entire RP agents at one time but use part of them in several installments, some air must be let in each time the aluminum bag is unsealed. To be exact, therefore, the RP agent's preserving ability will deteriorate bit by bit, though at a low level. Whenever you take some agents out, seal up the remaining agents after expelling as much of the air from the aluminum bag as possible.

