ThreeBond
TECHNICAL NEWS

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POSPAK

Introduction

As two-part curing resin used for such as bonding, sealing, coating, and casting, epoxy, unsaturated polyester, urethane, silicon, and acrylic resin etc. have been used from before.

However, all of them were separately stored in the container as liquid A and liquid B. Thus, it was troublesome to measure and mix the required quantity just before the coating. The research to eliminate these inconveniences has been conducted in each field from before.

This POSPAK system will solve these inconveniences of the handling once for all, therefore we believe that it will be useful in preventing insufficient curing caused by measuring mistakes.

In this issue, we will explain the packaging method, the processing method, the applications and the like.

Contents

1. Background of POSPAK

1-1. Advantages and Problems of Two-part Resins

The advantages of the two-part resins are listed below.

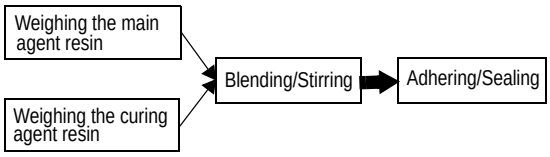
- No need for heat or UV irradiation during curing.
- Since the main agent and the curing agent can be selected for the purpose of the work, it has various properties and wide applications.
- Since it is separated to the main agent and the curing agent, the preserving property is good.
- Thick films or blocks are easily formed.

On the other hand, since the compounding ratio also differs according to the selection of the resins, measuring should be performed with great care. Although we often hear that our customers say, "The two-part resin does not cure," many of the reasons seem to be originated from the inaccuracy of the compounding (weighing and mixing) of the main agent and the curing agent.

The POSPAK will solve this problem and take advantages of two-part resins to the maximum.

1-2. Providing Two-part Resins with New Functionalities

The operation processes of two-part resins are as follows:



If the weighing work is saved from these processes, the advantages listed below will follow.

1) No need for weighing instruments.
2) Drastic cost reduction by shortening of the working hours becomes available.
3) By using with the accurate compounding ratio, the original characteristics of the resin itself can be demonstrated fully.

Aiming at these issues, we have developed the POSPAK, which can be "easily" used by "anyone" in "anywhere."

1-3. Characteristics of POSPAK

The basic packaging method is listed below.

1) Package each weighed component in liquid into the same container.
2) Gel one of the weighed component and package the gelled one and the other liquid (or paste) one separated by a diaphragm.
3) Gel both the weighed components and package with/ without a diaphragm.

Since all of the products are already weighed, they can be used by stirring as it is (if in case with a diaphragm, remove it) and confirming that the two components, which have been previously colored, have changed to uniform color.

Furthermore, because they are previously weighed, the compounding ratio does not vary according to the worker. Since whoever will conduct the work, the cured objects in the same state are obtained, which leads to reliability improvement as well.

1-4. Meanings of POSPAK

The POSPAK is the abbreviation of the following:

(P) retended
(O) ne-component resin (S) ystem
in can (Pa) c(k) age

This means that "looks like as a one-part type in appearance," indicating the package method of the POSPAK.

2. Mechanism of POSPAK

2-1. Fixation of Two Components

The two-part resin "reacts → cures" by contacting or mixing two components.

If the two components are separated, a long period of preservation is available. Therefore, the simplest method is the way to preserve each component in separate containers, which is used for many resins even today.

However, despite of good stability of this method, there is a "weighing" issue as mentioned above. To solve this problem, the following two methods are conceivable:

1) To make it the one-part type

2) To separate the two components somehow to fill in the same container.

From these, with the method 1) (in case of the one-part type), the harsh curing conditions such as heating or the UV irradiation is required, therefore the method 2) will be used to obtain good cured objects by room temperature curing with separation method devised.

2-2. Fixation Method

Although almost all the generally used two-part resins are liquid or paste, from the viewpoint of mixing workability, the liquid state is recommended.

However, from the viewpoint of the preserving property, since the activity of the solid is lower than the one of the liquid, the stability is high even in the case that the two components may contact. From that reason, the following methods have been examined as the methods to suppress the flow of liquid resins.

1) Addition of the fillers such as thixotropic agent and the like

2) Gelation treatment

The summaries of each method are given in the following sections.

2-3. Effect of Filling Agent

When silica fine powders are added to the resin, the 3-D like network structure is formed by the chained particles due to the sufficient dispersion interaction. If the shearing force by such as stirring is applied, the network structure is destroyed and the viscosity will decrease. On the other hand, if it becomes stationary state, the network structure will be regenerated and the viscosity will increase again. (Figure 1.)

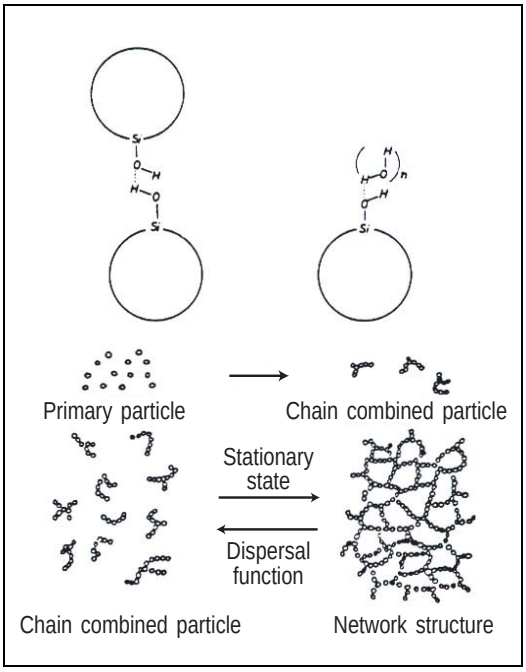


Figure 1. Interaction between AEROSIL particles

2-4. Gelation Mechanism

By affecting the gelling agent to the liquid resin, the amide groups of each molecule of the gelling agent are hydrogen-bonded each other, making the 3-D like network structure as illustrated in Figure 2, in which the liquid resin is embedded to loose fluidity and gelled.

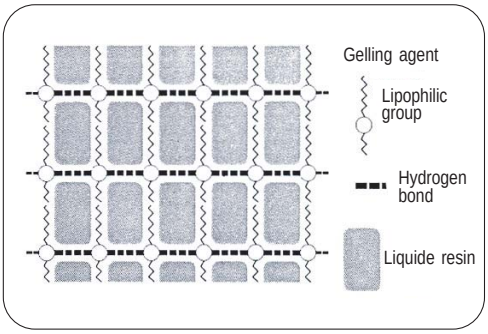


Figure 2. Gelation Mechanism

By light stirring, this gelled resin becomes soft right away because the hydrogen bond is cut (the network structure is destroyed), it is ready for mixing.

2-5. Principle of POSPAK

The flow of the liquid resin can be suppressed by the addition of the thixotropic agent or the filler. However, with this method, as the filler is added, the resin becomes

"harder," which means it does "not drip much."

Therefore, the stirring workability is adversely affected.

With the POSPAK, the gelation method has been adopted.

By gelling one component or the both components of the two components for fixation, the two components can be kept at stable state without contact or mixing.

In addition, the gelled resin has not got any chemical changes. Therefore, when the gel is destroyed by stirring and mixing, it changes from the solid state without fluidity in appearance to the extremely soft paste. It means that it can be used without waste at good stirring workability condition. It is like the conventional two-part resin without any adverse affect at all on the performance.

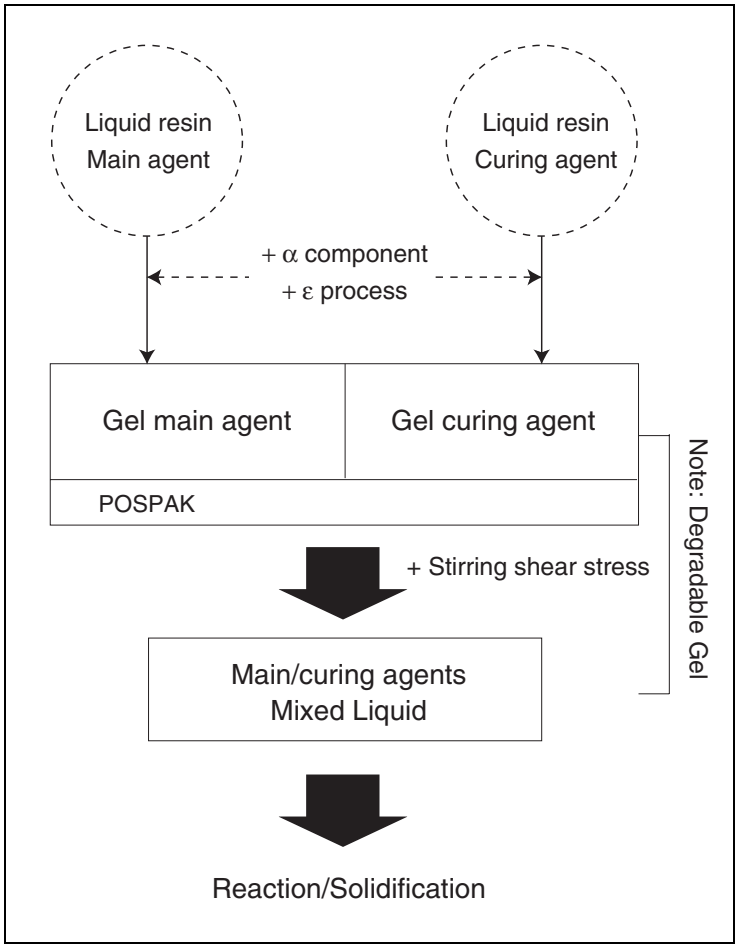
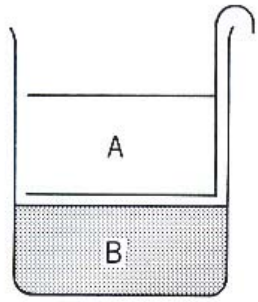
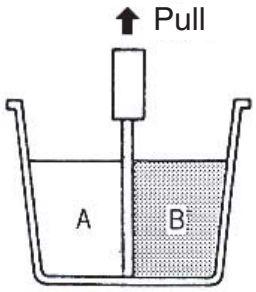


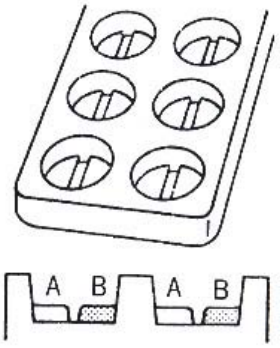
Figure 3. Principle of POSPAK

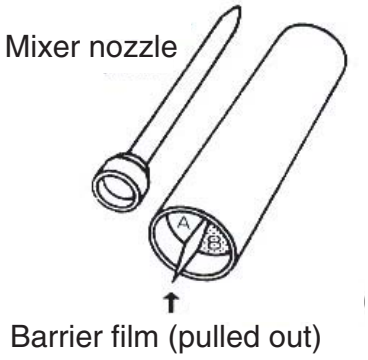
3. Classification and Characteristics

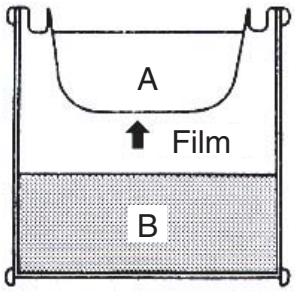
The products are divided according to the shape and the content as shown in Figure 4. into following six types: middle, mini, module, cartridge, P can, and dot. Characteristics of each one is listed below.

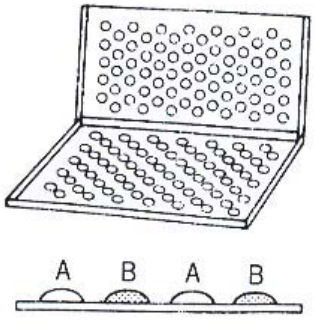
<table>
<tr>
<td>■ Middle Type ■
On the gellwed liquid A, a diaphragm film, and liquid B on it.
 

● Packaging with some 10 to 30g is available.
● Packaging of the one, which contains such as metal fillers, is available as well.</td>
<td>■ Mini Type ■
Gelled liquid A and liquid B are separated by a plastic diaphragm plate. They are mixed by removing the diaphragm.
Suitable for packages of some 2 to 3g.
 

● Suitable for packages of some 2 to 3g.
● Independent use of a single piece is available.</td>
<td>■ Module Type ■
Gelled liquid A and liquid B are molded and embedded into a single palette.
 

● Ten packages of some 2g.
● Can be used only by stirring as it is because of no diaphragm.
● Cheaper than the mini type</td>
</tr>
<tr>
<td>■ Cartridge Type ■
Gelled liquid A and liquid B are separated by a thin diaphragm film. After removing the film, the mixer nozzle is mounted for squeezing.
 

● For relatively large amount
● It can be used only by squeezing without mixing once the film is removed.</td>
<td>■ P Can Type ■
Liquid A is on the suspended film in the can, and liquid B is on the bottom of the can. They are mixed by tearing the film using the stirring rod.
 

● Packaging of some 100g to a few kg is available according to the needs.</td>
<td>■ Dot Type ■
Gelled liquid A and liquid B are aligned and stored in the finely arranged box, only the potions of liquid A and liquid B to be used are mixed.
 

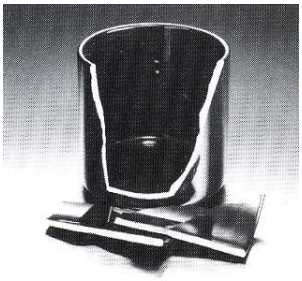
● For only small amount (under development)</td>
</tr>
</table>

Figure 4. Six types of POSPAK

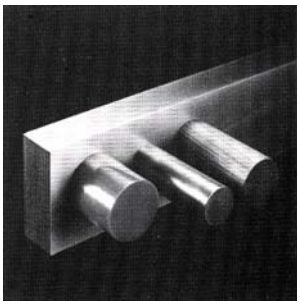
4. TB5500 Series

The main characteristics and the application examples of the products now available (and the future products) are shown in photographs and Table 1.

- For general bonding
- High adhesive force
- Low shrinkage

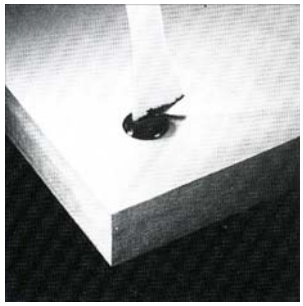


Adhesive repair of ceramics

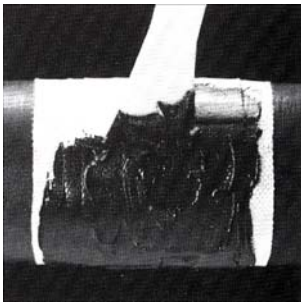


For bonding of plastics, metal, and wood

- For metal repair
- Excellent low temperature curing property; curing after 24 hours at 6 to 8 °C
- Low shrinkage (Aluminium system is sold for OEM)

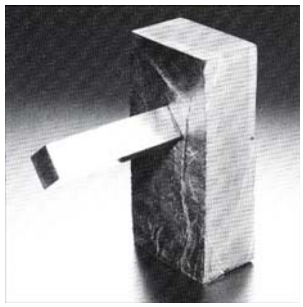


Filling repair of holes

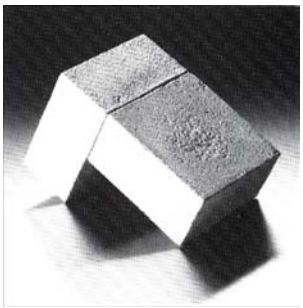


Fissure repair of pipes

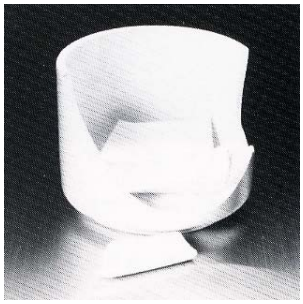
- Fast curing type
- Excellent low temperature curing property
- Low shrinkage



Bonding of stones and iron



Bonding of concrete



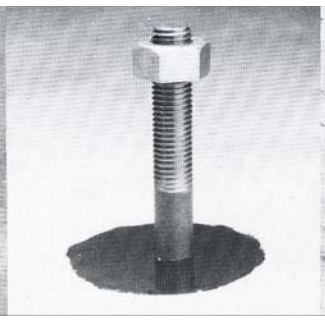
Adhesive repair of ceramics

Padding repair of concrete

- For general bonding
- Low shrinkage
- And uncolored TB5521C as high strength type

- The type with which not only the measuring but also the mix work is saved
- Excellent low temperature curing property
- Fine injection also is available

Bonding of pavement material such as reflection block



Adhesive fixing of anchor bolt

Injection filling to fissure parts of concrete

Table 1. POSPAK usages

Industry category	Service spaces or applications	POSPAK system
Electronics related	Casting of the magnet (POSPAK of TB2023/2102B)	P can
	Bonding of motor shaft and fan for domestic hair dryer	Module
	Adhesive repair of the holes of hot water tank and pipes of boilers	Middle
	Bonding and sealing of flange surfaces of each part of radars	Cartridge
	For brake coil casting	Middle
	Protection of the wiring in the control box inside the tank of filling stations	J can
	Infusion for audio heads	P can
	Fixation of commutators for motors of Matsushita Electric Works, Ltd.	Module
Automobiles, general machinery, and others	Places of booms and arm parts of power shovels with difficulty in welding	Middle
	Fixation of stools (anchor bolts) at manufacturing processing for pinball parlors	P can
	Bonding of plastic shower hooks of simplified shower sets and tiles	Module
	Utilization of the idea to use pencils by connecting each other	Module
	For repair of golf clubs (fitting adhesion of shafts and repair of heads)	Module
	Damage repair of concrete	P can
	Adhesive fixing of anchor bolt	Cartridge
	Fixing filler agent for installing reflector buttons	P can
	Bonding of road studs on road junction	P can
	Bonding of Holland Village souvenirs (ceramics/iron)	Module
	Fitting adhesion of the evaporation nozzle of kerosene fan heaters	Middle
	Adhesives for the production of blocks using stone materials (scraps)	
	Repair of surfing boards (fissure parts)	P can and J can
	Used at the edge of the molding box for building outerwalls	
	Bonding of cutting tool handles, bonding of upper lid of nail clippers	P can
	Repair of damage of the building	Cartridge
	Repair of the lifting part of luminous paint	Mini
Consumer related	Fix and repair of the motorcycle as a private brand	Middle
	As general adhesives	Module
	Adhesives for hooks such as wall curtain hooks	Mini
	For auto-repair shops as a private brand	All products (April)
	Sold as a private brand to stationers	Module

Conclusion

POSPAK is the newly developed product. Only part of the features have been deployed. We think that it has high future potential.

For example:

① By coating the two-part, acrylic-based instant heat-curing adhesive on the coating spatula with dot system, it will become the "high-performance instant adhesive," which can be used even by children (impossible with normal instant adhesives), at once.

② By spray coating microdots by the jet ink printing to the "glue allowance" of the adherend previously, it becomes so-called the " self adhesive member." If this processing has been conducted to the construction plywood, no pasting work is required, which raises the efficiency of the carpenters etc.

In this issue, we have introduced the products already developed and marketed based on the technical concept of the above-mentioned POSPAK. We will continue further reform and improvement based on these. Aiming strongly at improvement in characteristics and performance of epoxy resins and pursuit of the potential of applications to the resins besides epoxy resins, we will continue to develop easy-to-use products (performance, price, and workability) for customers from now on as well.

If you have any comments or advice, please don't hesitate to contact us.

Three Bond Chemical Co., Ltd.

President	Ikuzou Usami
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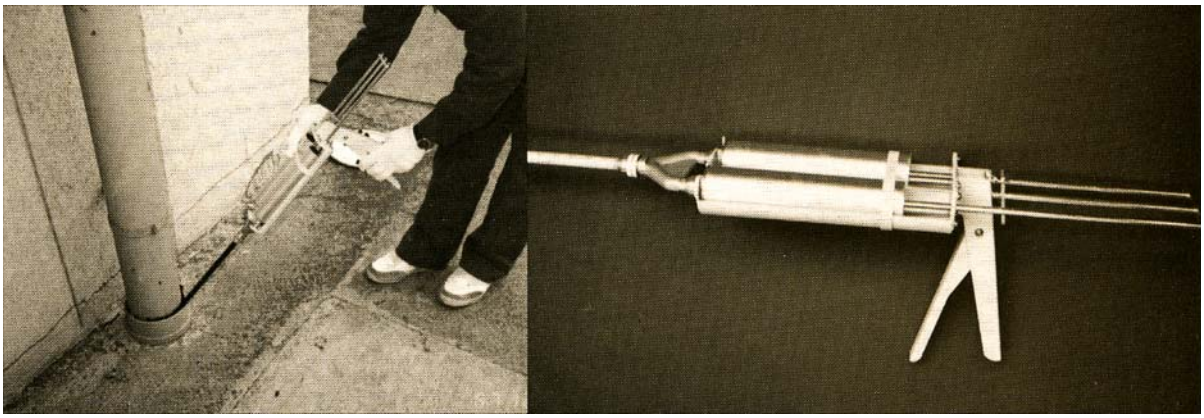
	Manabu Nakamura
	Toshiko Ogura

▶ Introduction of New Products ◀

Simple Mixing and Dispensing System for Two-part Resins "POSPAK Super-Cartridge-System"



◆ What is Super-Cartridge-System? ◆

The Super-Cartridge-System is the quantitative mixing and dispensing system for two-part adhesives.

At present, since the main agent and the curing agent are measured separately and stirred, it consumes time and money as well.The Super-Cartridge-System has been developed to overcome these inconveniences.

There are three kinds of guns (dispenser) for the Super-Cartridge-System. Starting with the hard gun type, which will be released in July, preparation and planning of the electric gun type and the air gun type is under way.

◆ Method of Application ◆

Fill the main agent and the curing agent of the two-part adhesive etc. separately in the 1/3ℓ cartridge container used commonly for general sealants. Next, mount the cartridge to the mixing head and the static mixer to squeeze to dispense. It is just a simple method.

◆ Types of Resins ◆

- Foam silicon (conduit, cable sealant for fire protective agent)..... Will be released in July
- The second-generation acrylic-based adhesives for construction (SGA) ..... In preparation
- Epoxy-based adhesives ..... In preparation
- Urethane-based adhesives for construction ..... In preparation

ThreeBond TECHNICAL NEWS

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