Intumescent Material
"Fi-Block" expands in fire to perform a fire-resistant function.
"Fi-Block" is a new type of fire-resistant material that expands in fire.

"Fi-Block" is thin, flexible organic fire-resistant material made using Sekisui Chemical’s plastics technology. It differs from conventional, inorganic fire-resistant material because the heat generated by a fire causes it to expand, allowing it to perform its fire-resistant, fire prevention function rapidly and efficiently.

In its ordinary state, the material comes in a thin sheet and is attached as tape, making it easy to bend and cut. The potential for applications in fire-resistant design is unlimited, as it is the optimum material for narrow or small spaces. We offer two types of material for different uses: butyl "Fi-Block" or epoxy "Fi-Block".

Features

(1) Expandable
This material will not expand in normal, room temperature conditions, but when heated to more than 200°C, it will expand from 5 to 40 times its original size to form a fire-resistant char (it can be adjusted or designed to conform to the use required.) It has great insulating characteristics, and fulfills ISO 834 requirements by withstanding the heat of a fire for two hours, preventing loss by fire.

(2) Easy to use
Its thin, flexible shape makes it easy to bend or cut. It also can be easily installed in narrow or small spaces, which have always been hard to deal with.

(3) Adhesive
The butyl "Fi-Block" has adhesiveness, facilitating provisional installation or layering with other materials. Layering it with different surface coverings enables a strong or flexible design as needed. The epoxy "Fi-Block" can have adhesiveness by our processing.

(4) Environmentally friendly
It contains no halogen compounds, which can be environmentally friendly and there are no concerns of toxic gas emissions when heated. The material does not disperse dust during installation, so it is safe for workers and other people nearby.

Example:
A 2 mm thick sheet expands 10 times to a thickness of 20 mm.

Innovative Fire-resistant Material

<table>
<thead>
<tr>
<th>Roll type</th>
<th>Sheet type</th>
<th>Tape type</th>
</tr>
</thead>
</table>

1. Forms a layer of fire-resistant char when a fire breaks out, or when heated.
2. Thin sheet
3. Heated (More than 200°C)
4. Expansion
5. The expansion is only in the thickness.

Butyl "Fi-Block" or epoxy "Fi-Block"
"Fi-Block" is rich in potential. It keeps the safety of buildings and vehicles, retards the spread of fires, protects equipment and facilities, and saves space.

Wrap it around fuel tanks and engines and use it to prevent the spread of fire in case of an accident.

Using this material on the interior of passenger seats, around engines, and on the walls of freight compartments increases safety, saves space, and reduces weight.

Install it around the bulkheads and piping on passenger ships, oil tankers, and other vessels to prevent the spread of fire if one breaks out.

Use it to prevent the ignition from the electronic equipment.

Use it to protect bridges and tunnels.

Use it on walls, roofs, columns, beams, floors and other locations.
Application Examples of Easy Installation in Buildings and Housing

More companies are using the material in the housing and construction materials sector, which requires exceptional fire-resistant and fire-protection performance.

“Fi-Block” is exceptionally thin, flexible, easy to use, and safe. We are working with our Fire-Resistance Design Center to evaluate the material’s performance from the standpoint of product design. It has been used in a wide range of fire-resistant structures in housing, and for construction material.

**Buildings**
- Steel frame coverings (Ex.1)
- Exterior wall coverings, including precast concrete and curtain walls

**Housing**
- Roof vents
- Vents under the eaves (Ex.4)
- Vinyl sashes
- Fireproof doors (Ex.3)

**Ex.2**
**Sites where divisions are penetrated**
- Just wrap it around the object

**Ex.3**
**Doors**
- Normal circumstances
- During fires
- It expands during fires to seal off the spaces in the frame, prevents the spread of fires, and retards the combustion of the wooden core.

**Ex.4**
**Vents**
- Normal circumstances
- During fires
- It expands during fires to seal off the spaces in the air vent path, preventing the spread of fires.

More companies are using the material in the housing and construction materials sector, which requires exceptional fire-resistant and fire-protection performance.
1. Expansion Performance
It expands when the heat reaches 200°C.

Example: The butyl "Fi-Block" expands roughly 10 times.

Example: The epoxy "Fi-Block" expands roughly 30 times.

2. Insulation Performance
When this 2 mm sheet expands, it provides exceptionalinsulating performance equivalent to inorganic fire-resistant material 25 mm thick.

- Heat resistance figures indicate the difficulty of heat conduction. The higher the number, the more resistance there is to heat conduction. Heat resistance is calculated using the following formula:
Heat resistance (K·m2/W) = Material thickness (m) / Heat conduction ratio (W/m K)

- No major change in the expansion ratio is observed under environmental conditions at high temperature and high humidity (80°C, 85% RH).

3. Long-term Performance Stability
No major change in the expansion ratio is observed under environmental conditions at high temperature and high humidity (80°C, 85% RH).

4. Safety
This environmentally friendly material limits VOC. None of the 14 materials designated by the Ministry of Health, Labor, and Welfare (Japan) as contributing to the "sick house" phenomenon is used as primary materials or in the manufacturing process.

VOC Emission Speed (g·m⁻²/h)

<table>
<thead>
<tr>
<th>Material</th>
<th>10 times expansion</th>
<th>30 times expansion</th>
<th>30 times expansion</th>
<th>Vinyl chloride decorative plywood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toluene</td>
<td>0.4</td>
<td>0.2</td>
<td>1.6</td>
<td>725.6</td>
</tr>
<tr>
<td>Xylene</td>
<td>Less than 0.1</td>
<td>Less than 0.1</td>
<td>1.8</td>
<td>1197.6</td>
</tr>
<tr>
<td>TVOC</td>
<td>210.0</td>
<td>95.0</td>
<td>482.0</td>
<td>4245.0</td>
</tr>
</tbody>
</table>

5. Basic Specifications

<table>
<thead>
<tr>
<th>Base resin</th>
<th>Expansion ratio</th>
<th>Surface material</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butyl rubber (mild adhesion tape)</td>
<td>10 times</td>
<td>Aluminum foil layered paper</td>
<td>0.5–6mm</td>
</tr>
<tr>
<td></td>
<td>30 times</td>
<td>Aluminum laminated glass cloth</td>
<td></td>
</tr>
<tr>
<td>Epoxy resin (leaf sheets)</td>
<td>30 times</td>
<td>Non-woven polyester cloth</td>
<td>1–2mm</td>
</tr>
</tbody>
</table>

*1: The values for properties are representative and not standard.
*2: Evaluation at our company’s facilities.
*3: For PET film / T Peel strength.
*4: Basic information, subject to change.
*5: For PET film / T Peel strength.
*6: For PET film / T Peel strength.

© Application with adhesive agent is possible as required. 
© Inquire separately about sizes.
SEKISUI CHEMICAL CO., LTD. conducts performance evaluations of all types at our Fire-Resistance Design Center. We offer proposals and technical support for specific designs capable of fulfilling your requirements for different fire-resistant and fire prevention uses.

### Horizontal furnace
- JIS A 1302 (Grade 2 fire protection)
- JIS A 1304 (1 hour fire resistance)
- ISO-834 (1 to 2 hours of fire protection and resistance)
- Effective heat area: 1000 x 1600 x 1300 (H) mm
- Uses: Columns, beams, floors, roofs

### Vertical furnace
- JIS A 1302 (Grade 2 fire protection)
- JIS A 1304 (1 hour fire resistance)
- ISO-834 (1 to 2 hours of fire protection and resistance)
- Effective heat area: 1000 x 1000 mm
- Uses: Walls, fireproof doors, under eaves, sashes

### Cone Calorimeters
- ISO-5660 (Heat volume, heat speed)
- Size of test piece: 100 x 100 mm
- Uses: Noncombustible trials, semi-noncombustible trials, fire resistance trials

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**Solution for your Fire-Resistant Needs**

**Highlights of "Fi-Block"**

- Innovative, fire-resistant material
- Intumescent: Expands up to 40 times
- Easy installation
- Available in various forms and sizes
- Multiple applications
- Long-term performance stability
- Environmentally friendly

![Fi-Block images](image1.png)