

# 【FREY FREY-K】

~ new proposal for thermal solution~



®分子均配膜 ®メークリンゲル  
共同技研化学株式会社

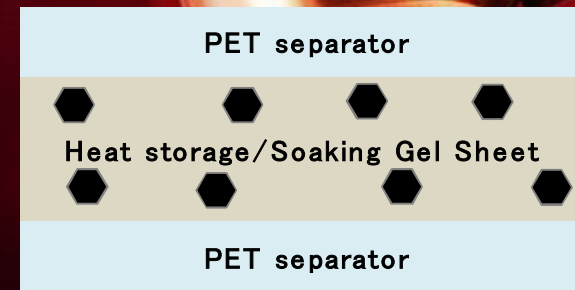
【KGK Confidential】

# Product Summary

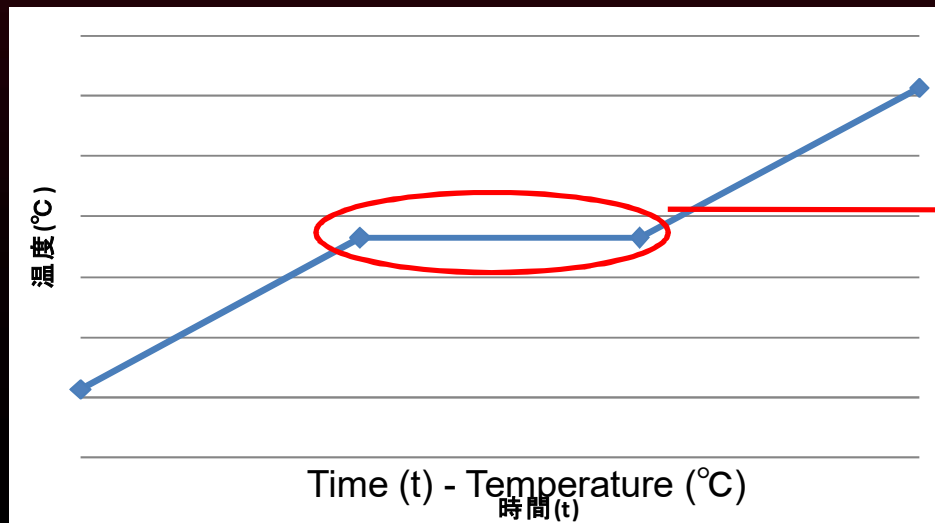
## Product Summary :

This is a compound heat storage adhesive sheet obtained by kneading the heat storage filler acrylic base, and , a certain period of time , we will maintain the sheet temperature at any temperature .

## Product configuration :

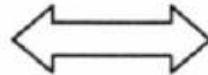


Thickness : 50 ~ 500 $\mu$ m



A certain period of time , I will keep the sheet temperature at any temperature .

## FREY Characteristic principle



When material changes ,  
temperature is  
constant at  
the melting point .



In the case of water  $\leftrightarrow$  ice , temperature is constant at 0 °C melting point ( or freezing point ) . Depending on the material , and butter if 15 °C about , you Dekia m the temperature constant at 25 °C about it if chocolate .

**The thermal storage filler Were kneaded  
the compound Is heat storage sheet**



# Physicality

Product	Property		Measuring method
Heat storage/Soaking Gel Sheet	Melting point (°C)	10~60	DSC法
	Heat of fusion (cal / g)	33~45	DSC法
	Specific gravity	0.8	—
	Hardness	45~50	AskerC
	Volume resistivity ( $\Omega \cdot \text{cm}$ )	$2.1 \times 10^{15}$	—
	Dielectric constant	2.6	1kHz
		2.3	1MHz
	Breakdown voltage (kV / mm)	15.7	—
	Thermal conductivity (W / m · K)	0.2	—

# 【FREY-K Basic physical property values】

※thermal storage medium properties

	FREY	FREY-K
color	white	black
specific heat	—	600~800J/kg·K
thermal conductivity	0.3~1.3W/m·K	3~5W/m·K
heat capacity	100~200J/g	700~1100J/g
transition temperature	30~40°C	60~70°C


【common size】

thickness: 100 $\mu$ m $\pm$ 20



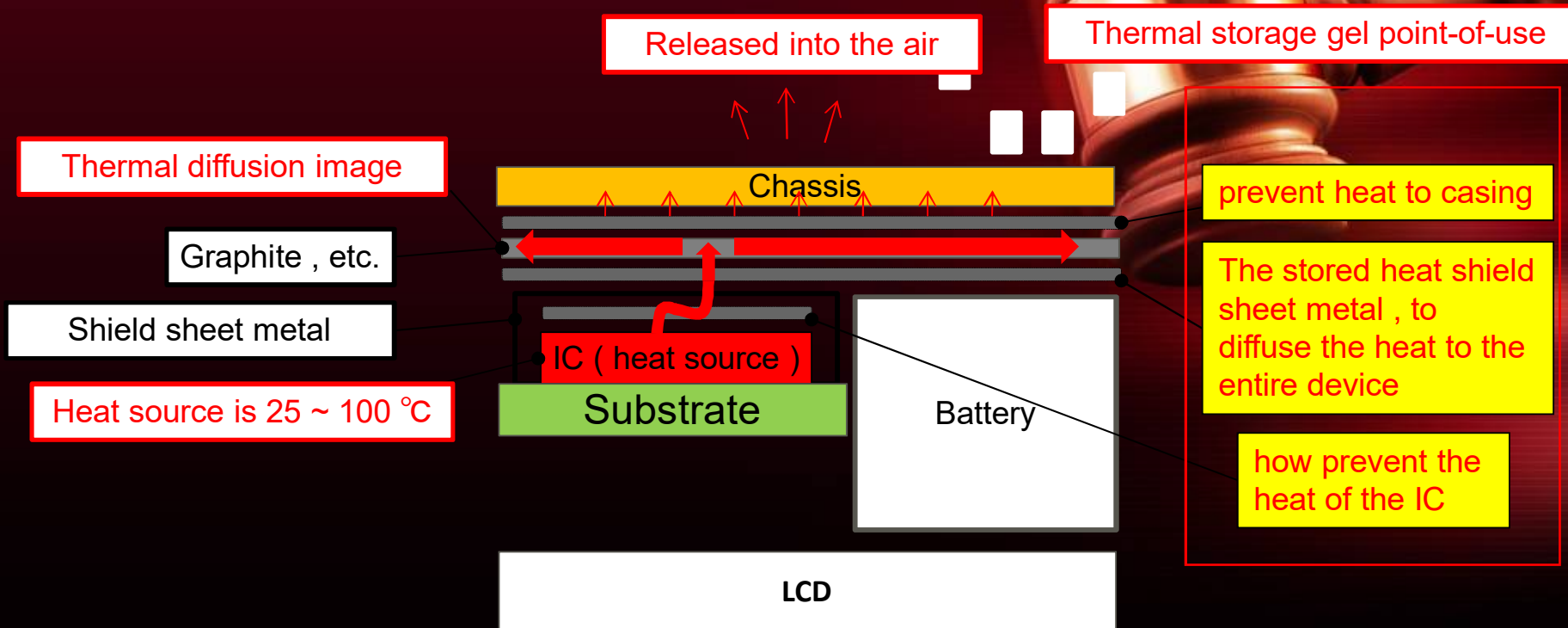
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# 【FREY-K Basic physical property values】



evaluation items	FREY	FREY-K
<b>adhesive force</b>	10N/25mm	15N/25mm
<b>percent elongation</b>	1000%	500%
<b>rupture strength</b>	0.5N	0.5N
<b>specific gravity</b>	0.8	1.5

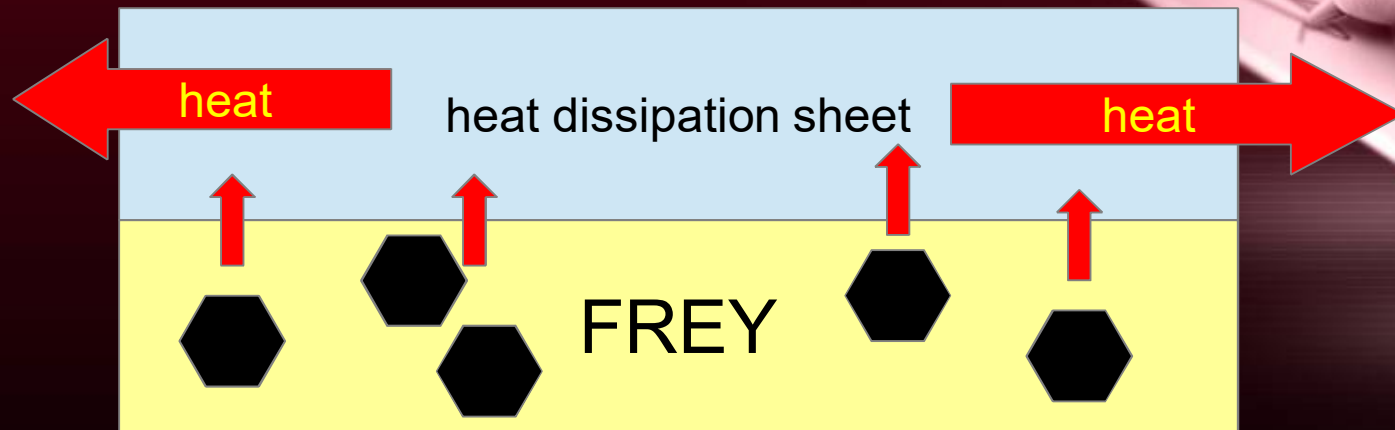
# Use applications



# 【FREY-K proposal】

## FREYseries proposal

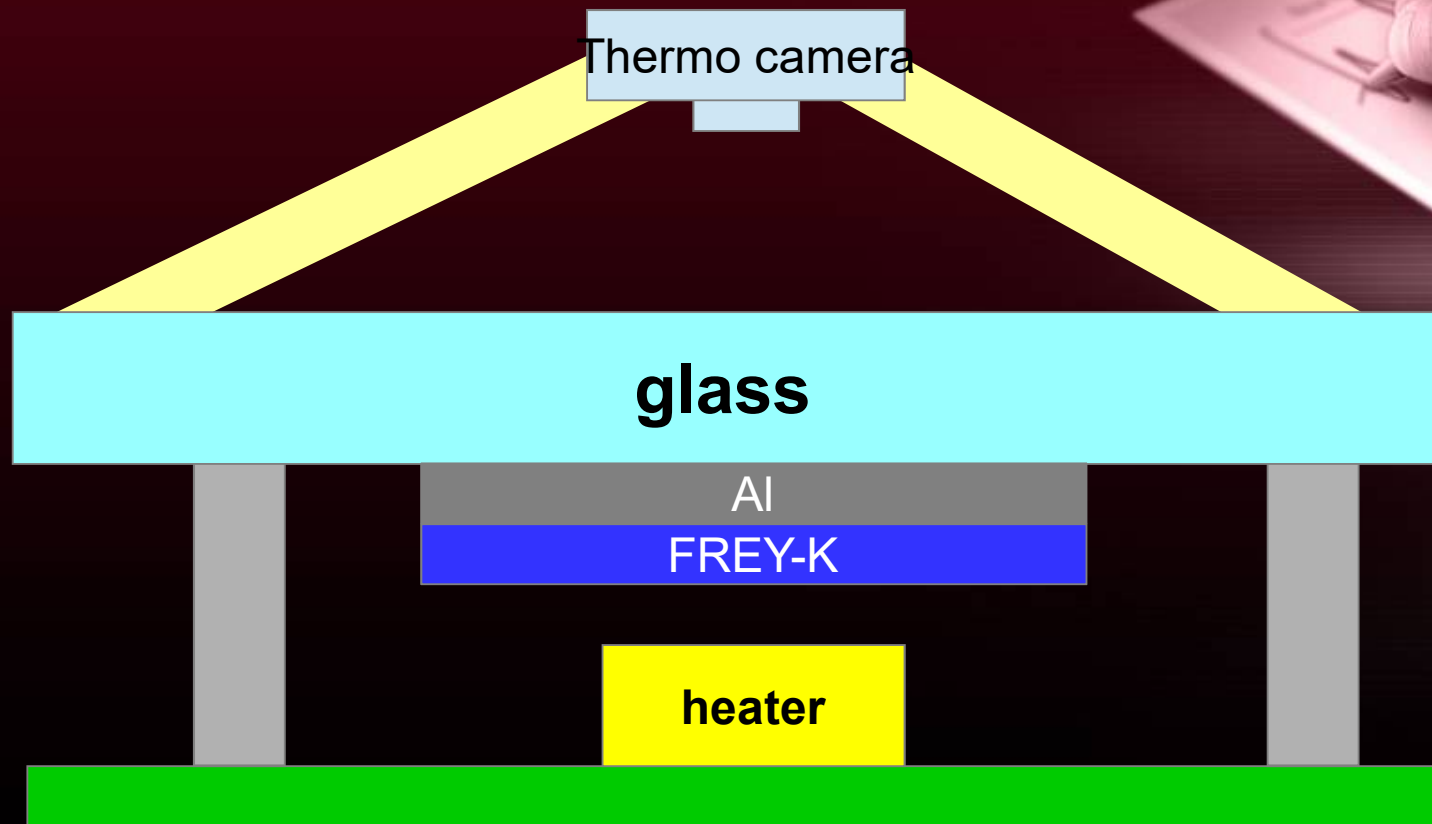
we provide the product combined FREY with the heat dissipation sheet



The heat transferred from FREY in vertical direction, spreads in surface direction through the heat dissipation sheet .



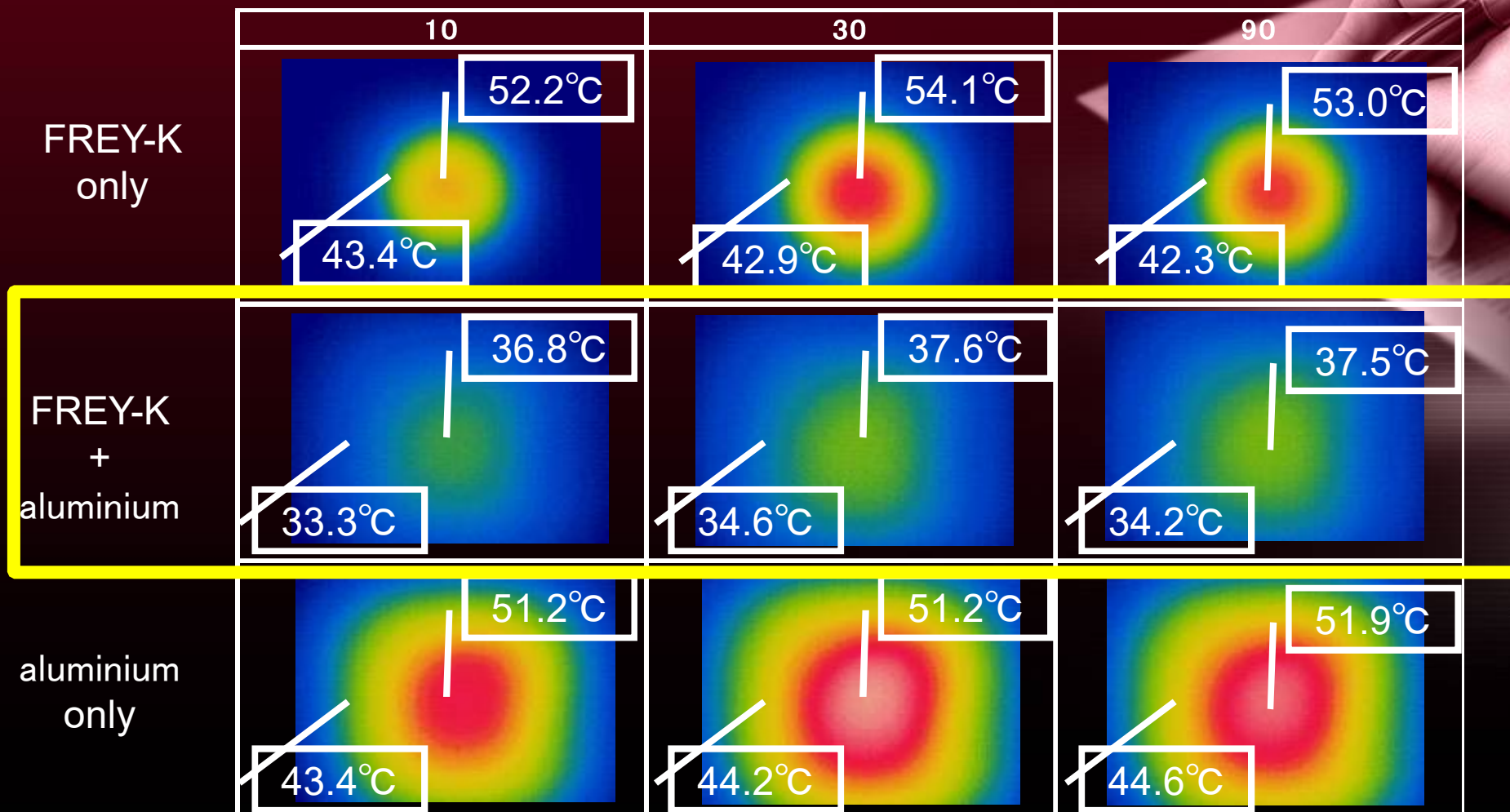
# 【 Test procedure 】 the Image of test



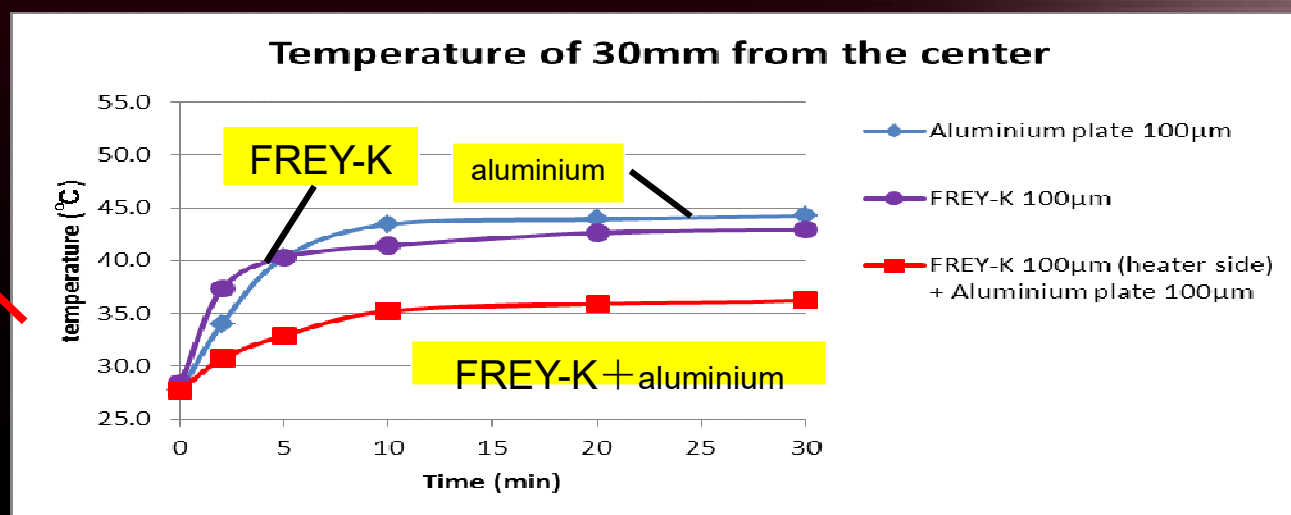
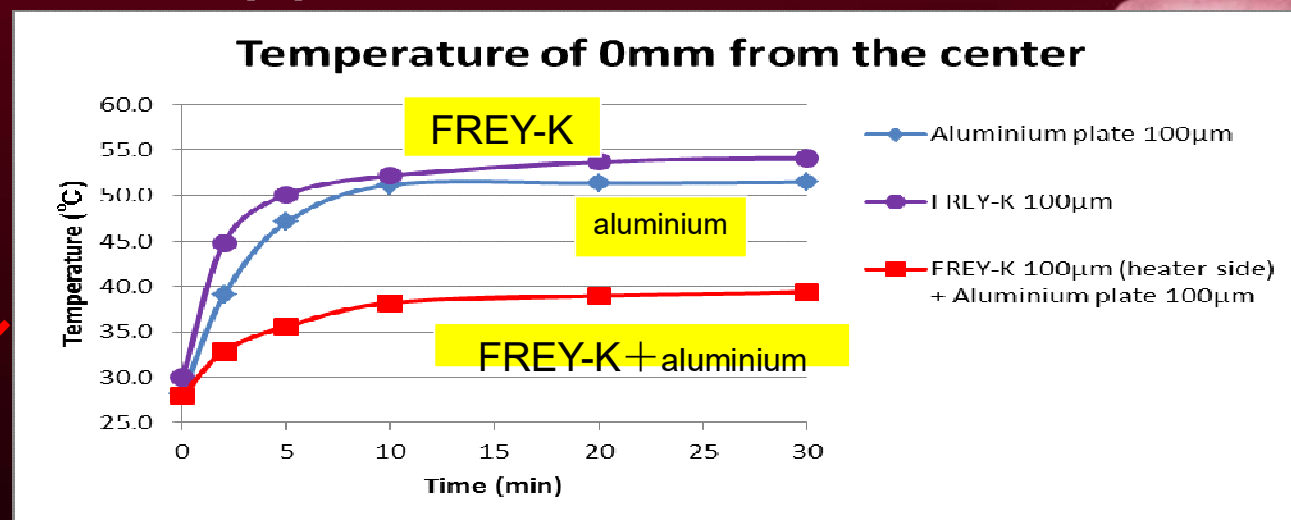
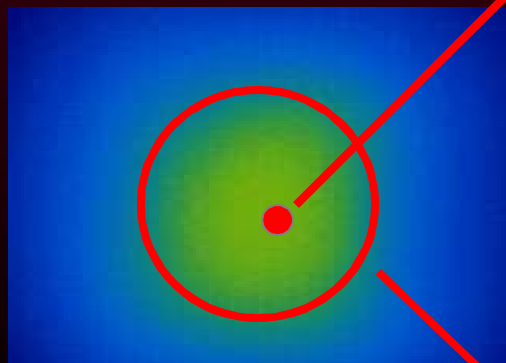
## 【 Evaluation method 】

- Cut the sample into 60mm×60mm piece, and past it to the surface of glass case on the heater side.
- Heat the glass case  $100^{\circ}\text{C} \pm 5^{\circ}\text{C}$  for 90 minutes. Switch the heater off and leave the sample cool to room temperature
- Measure the surface temperature of the glass case with a thermography camera and a thermocouple

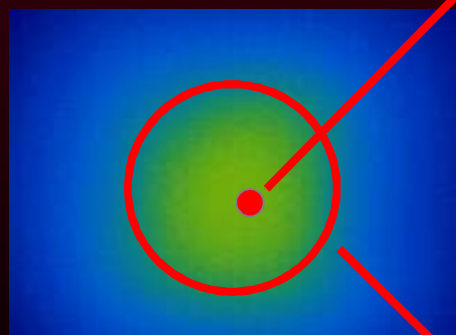
# 【 Temperature rise suppressant effect of FREY-K 】



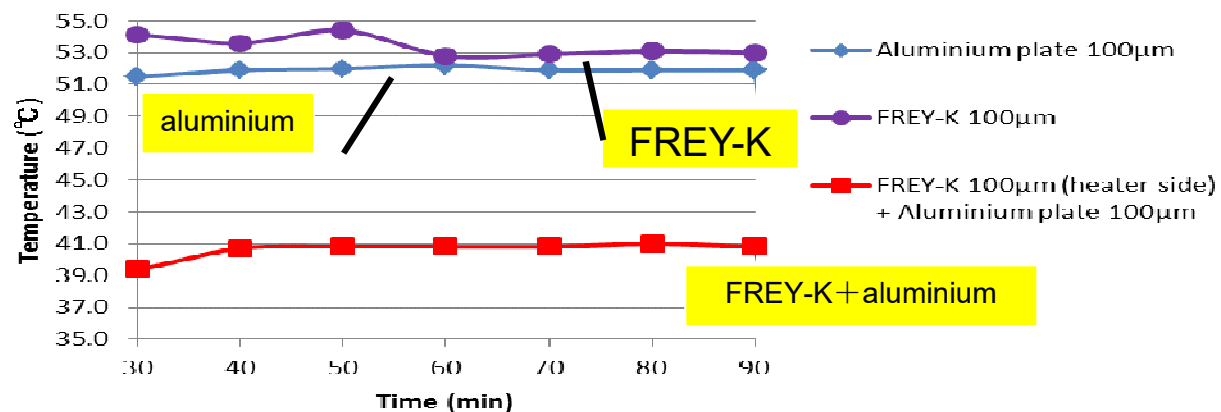
# 【Temperature rise suppressant effect of FREY-K】



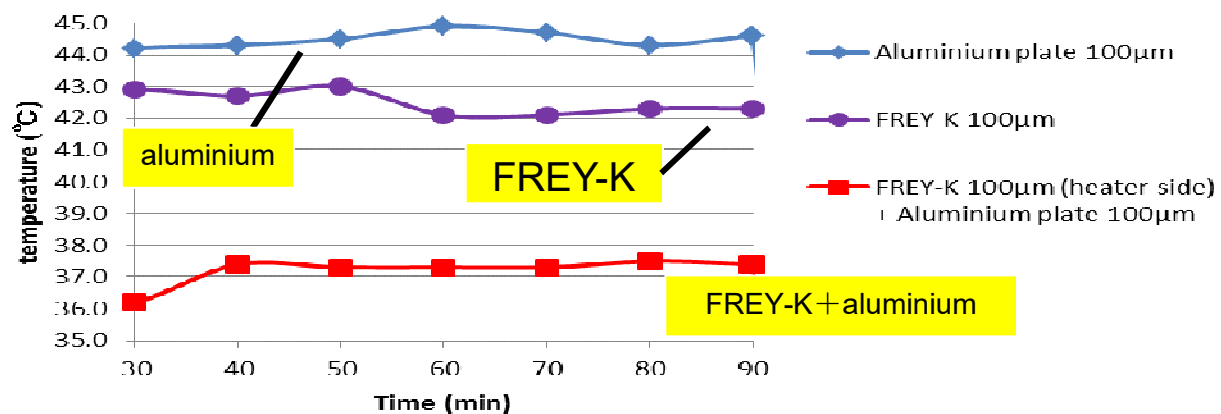
# 【FREY-K'S steady state of temperature】



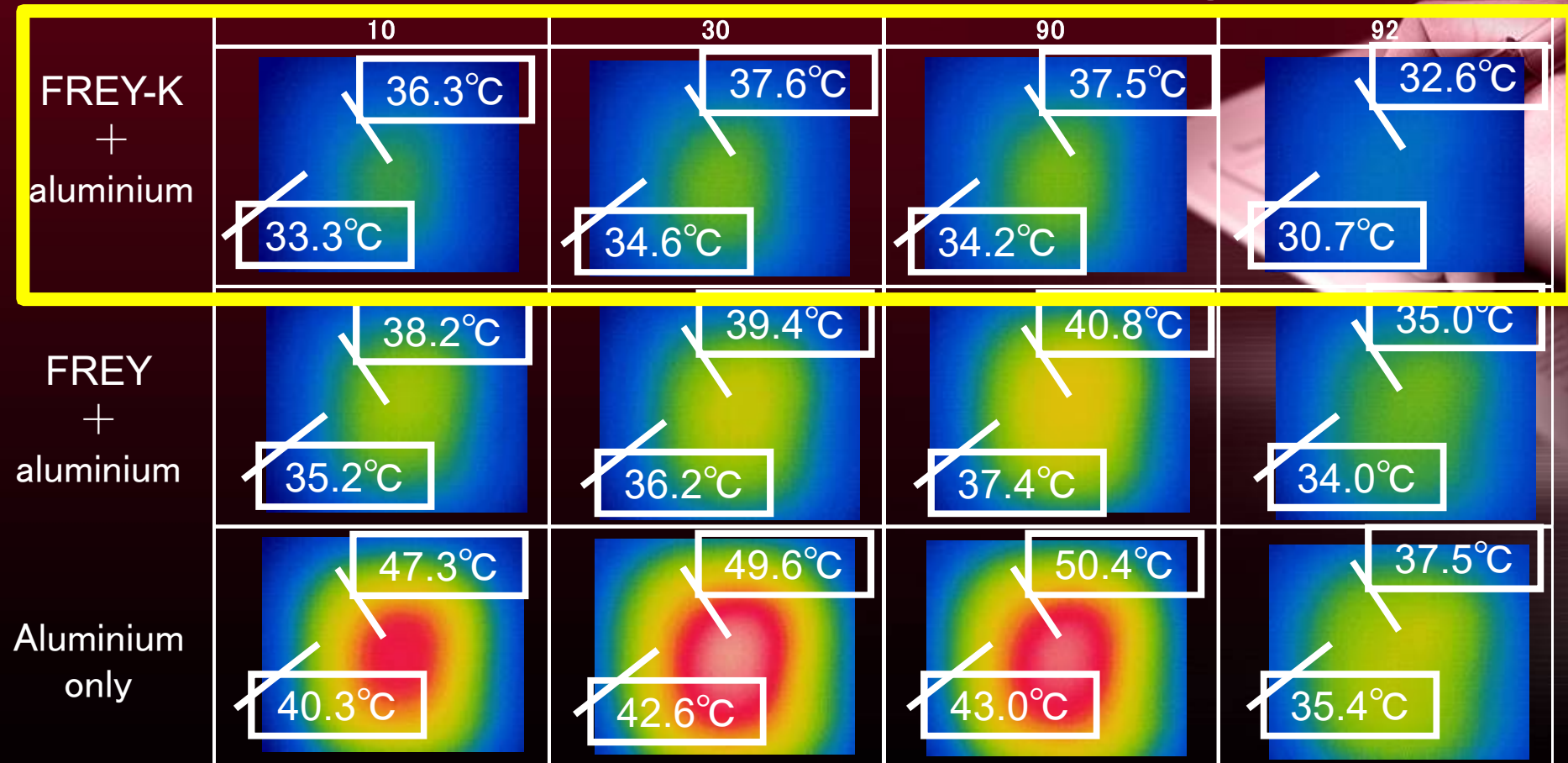
## Temperature of 0mm from the center



## Temperature of 30mm from the center



# 【FREY Seris temperature rise controlling effect】



Heat spreads entirely to high temperatures in case of using aluminium only.

FREY-K curbs high temperatures.

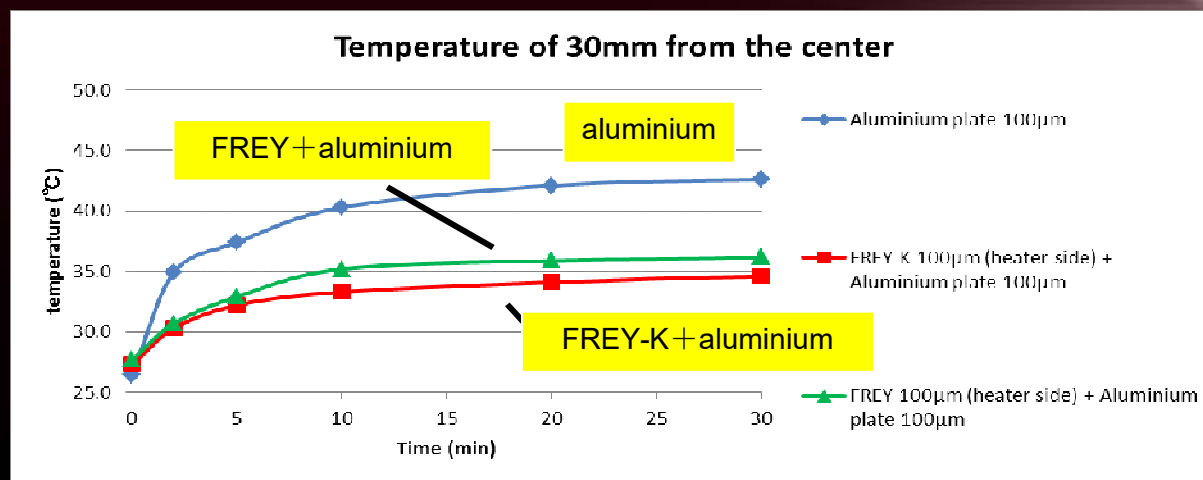
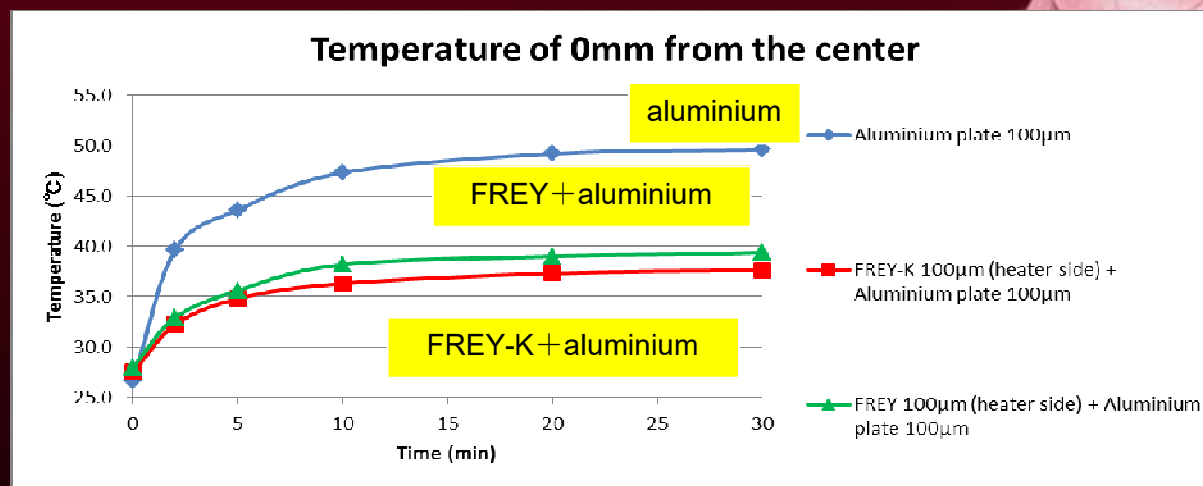
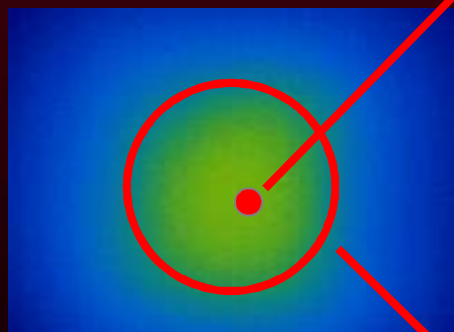
# 【 Temperature rise suppressant effect 】

## FREY·FREY-K'S effect

	FREY+Al	FREY-K+Al
position of center maximum temperature	41.0°C (Al difference : 9.4°C)	37.9°C (Al difference : 12.5°C)
30mm away off the center maximum temperature	37.5°C (Al difference : 5.8°C)	35.3°C (Al difference : 8.0°C)

- The effect is further increased by bonding aluminium and **FREY·FREY-K** together than taking use of aluminum only.

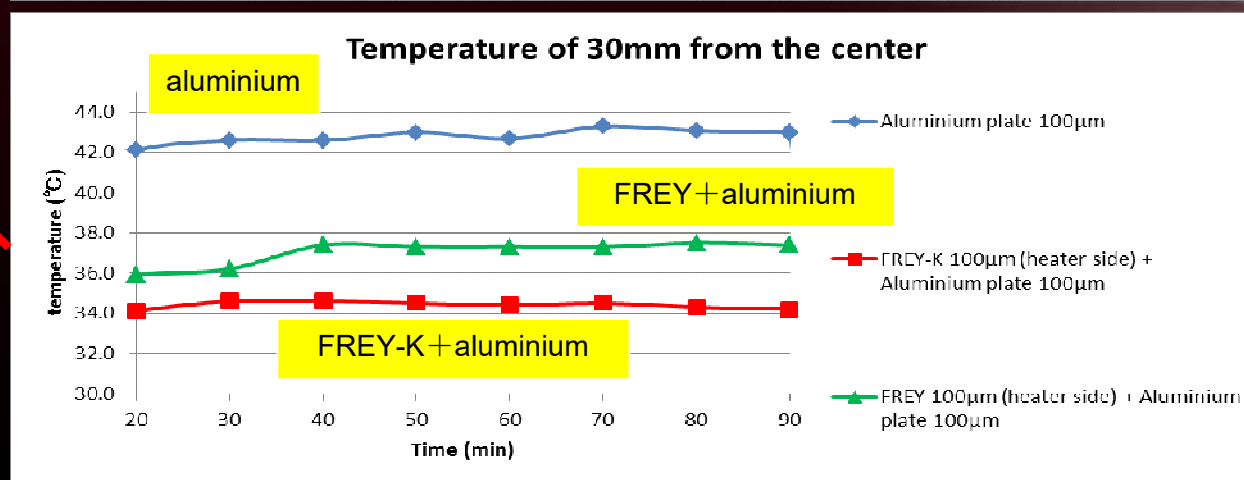
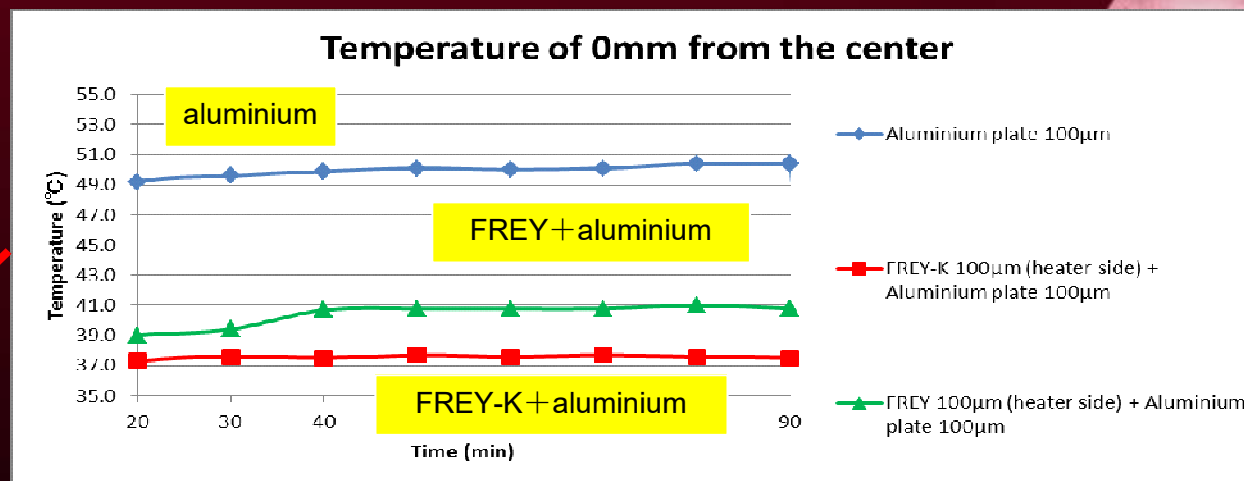
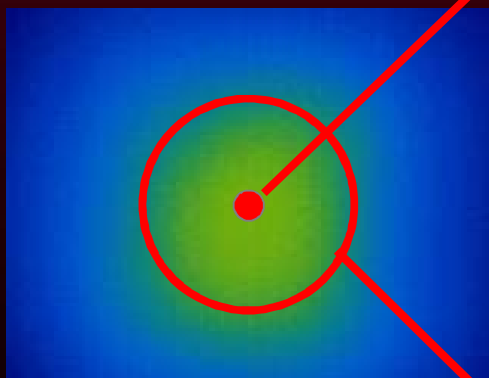
# 【FREY Changes in temperature rise】



FREY-K has low maximum temperature, as well as center temperature and ambient temperature.

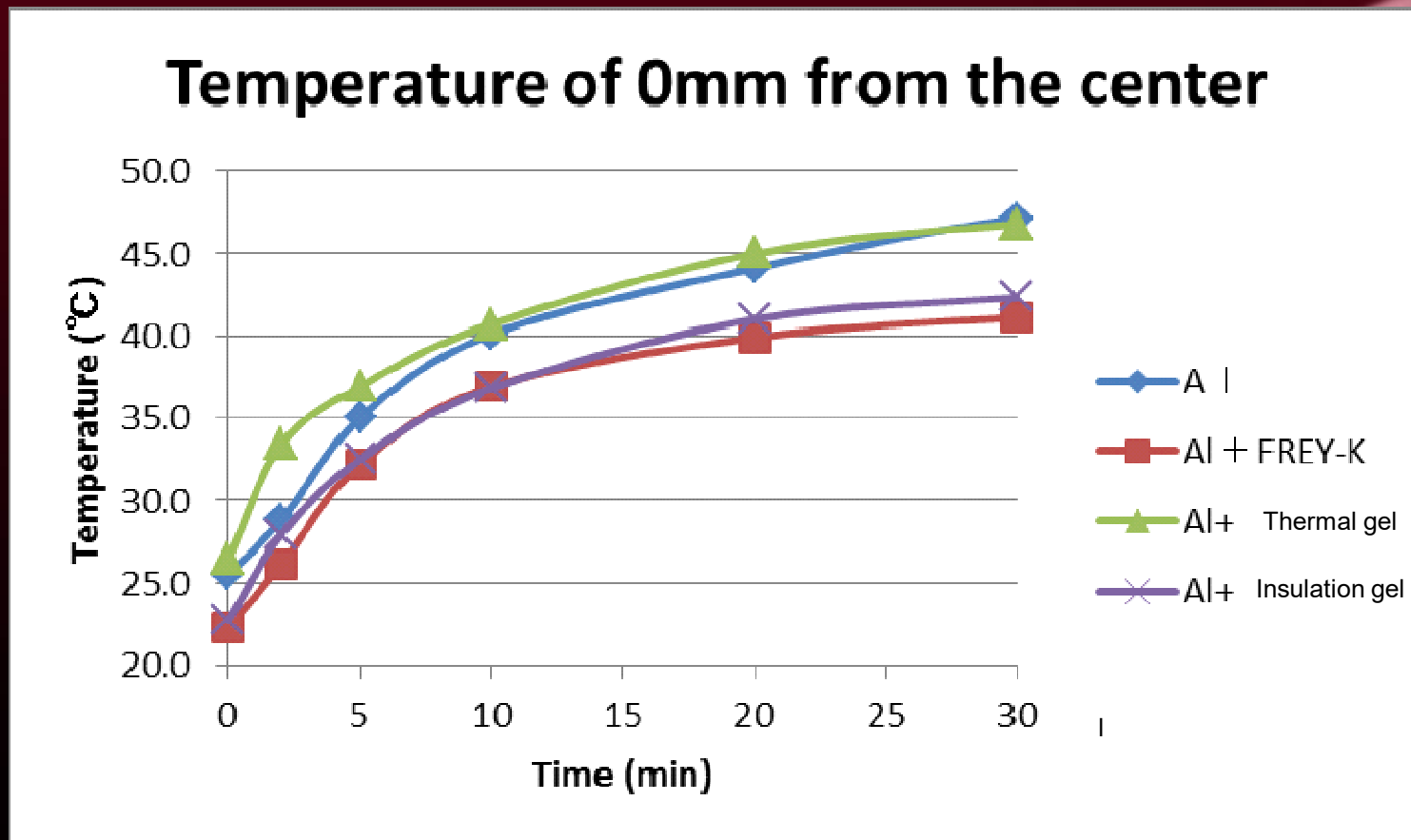


# 【FREY stable state of temperature】

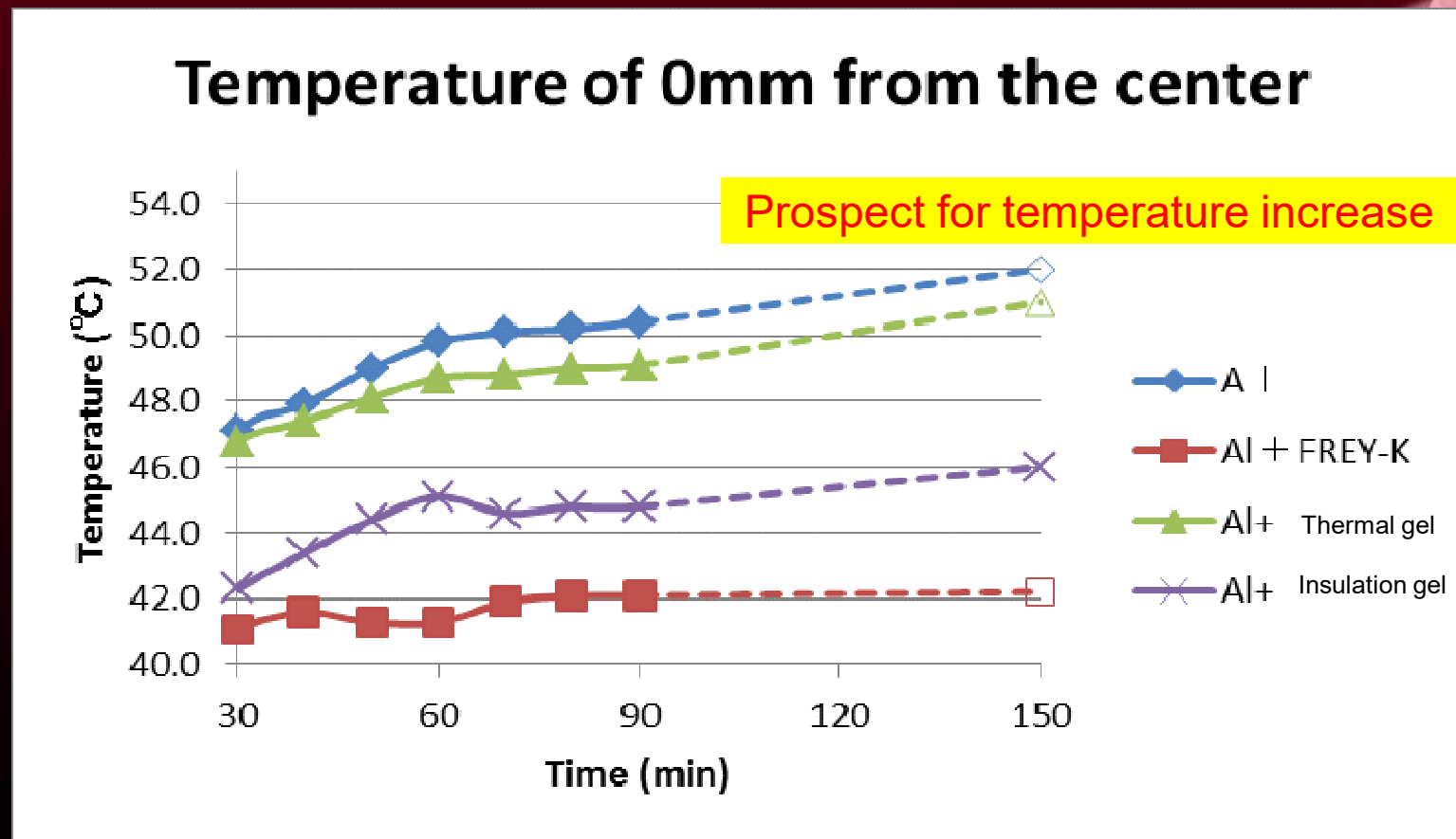


Stability is secured at a constant temperature, even with use for a long time.

## 【 Temperature rise suppressant effect of each item 】



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Stability is secured at a constant temperature, even with use for a long time.  
The heat radiation gel and the insulating gel have a tendency that temperature rise is in direct proportion to time.

## *End of presentation*

User is responsible for determining whether the KGK product is fit for a particular purpose and suitable for user's method of application. Please remember that many factors can affect the use and performance of a KGK product in a particular application. The materials to be bonded with the product, the surface preparation of those materials, the product selected for use, the conditions in which the product is used, and the time and environmental conditions in which the product is expected to perform are among the many factors that can affect the use and performance of a KGK product. Given the variety of factors that can affect the use and performance of a KGK product, some of which are uniquely within the user's knowledge and control, it is essential that the user evaluate the KGK product to determine whether it is fit for a particular purpose and suitable for the user's method of application. KGK make no warranties on above data.

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