Thermal Conductivity Comparison of Heat Dissipating Material

Goal

The heat conductance of several heat dissipating materials having different thermal conductivity and shapes is measured by the heat flux sensor and compared.

Measurement Method

The heat conduction of the heat radiation material is measured by the heat flux sensor. Details of the heat dissipating material used are as shown in Table 1, and the thermal conductivity is better in (2), but the shape of the material is different between the liquid type and the sheet type. The difference of shape comes from the difference in the contact degree when installed on the copper plate. Compared to the sheet type (2), the liquid type (1) adheres to the irregularities on the copper plate surface more naturally, so it seems that the loss of thermal conduction is small. We are going to clarify the relationship of the contact condition and thermal conductivity using the heat flux sensor.

Measurement Method

As shown on Fig.1, a heat dissipating material is placed between the heat source and the and water cooling jacket. This material together with the heat flux sensor are sandwiched together on the copper plate and heat flux and temperature being measured in the same environment. The heat source output is also turned on and off and the change at these times is also monitored. 3 Cycles (1 Cycle = On 3min, Off 7min).

Table 1 Details of Heat Dissipating Material

Material Name	Thermal Conductivity	Shape
①:GF1500LV	1.8(W/m·K)	Liquid Type
2:GP2000S40	2.0(W/m·K)	Sheet Type







Results

The heat flux sensor, as shown by the graph on the right, has a slightly higher heat flux output in the case of ① GF1500LV. The results indicate that the influence of the heat transfer loss caused by the shape of the material was larger than the difference of the thermal conductivity of that material.

In addition, the change in heat flux is clearly correlated to the output of the heat source. Such a phenomenon was also grasped.

Considerations

Although this time it was difficult to clarify such a slight difference in thermal conductivity, we can clearly say that it was made possible by directly measuring the heat flux through the heat flux sensor. This feat would have been very difficult to determine through mere temperature measurements. Moreover, by applying such a measurement method, we can conclude that on top of simplifying the measurement device of heat conduction including the measurement itself, it also drastically improves measurement accuracy.

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