KMHP-100 MEMS Micro-Hotplate

General Description

KMHP-100 is the industry's first commercially available off-the-shelf MEMS microhotplate for researchers and scientists in chemical micro-sensor research and development applications. KMHP-100 microhotplates are based on Kebaili Corporation's proprietary 1 mm^2 microchip die size MEMS micro-sensor platform technology.

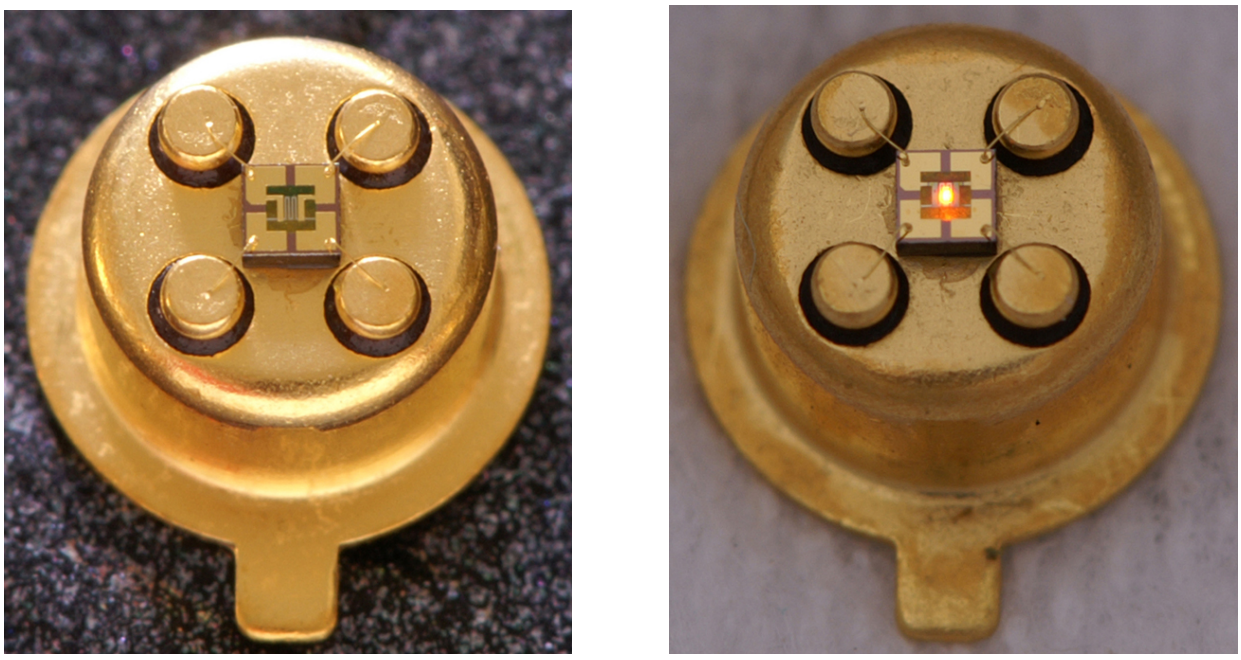

Figure 1. KMHP-100 Microhotplate

KMHP-100 consists of a micromachined silicon die that is packaged in a gold plated TO-18 package via gold ball wire bonding for electrical connection, which insures reliable operation in harsh and hostile environment applications.

The resistive thin-film platinum-based micro-heater sandwiched between a freestanding thin-film silicon nitride membrane at the bottom, and a thin-film silicon dioxide layer at the top, allows the microhotplate to operate continuously and reliably at temperature up to 650°C.
The freestanding thin-film silicon nitride membrane thermally and electrically isolates the microheater from the silicon substrate microstructure, and provides the microhotplate with a low thermal mass.

Only four electrical connections are used in the KMHP-100, as shown in figure 1, the bottom two electrical connections are used for the thin-film platinum microheater, and the top two electrical connections are connected to the two gold electrodes that will provide electrical contact to the user-specific sensing layer, which is the material that will be microdeposited by the user on the microhotplate.

The KMHP-100 microhotplate dimensions are:

- KMHP-100 die ➔ 1000 μm x 1000 μm
- Silicon nitride membrane ➔ 500 μm x 500 μm
- Platinum micro-heater ➔ 250 μm x 250 μm

Kebaili Corporation KMHP-100 microhotplates allow researchers and scientists to develop innovative and ultra-highly sensitive and selective chemical sensors based on sol-gel processes, doped metal oxides, polymers, functionalized carbon nanotubes and nanowires. These novel chemical microsensors will be used in medical, industrial, military, automotive, environmental, agricultural, space and homeland security applications.

Many creative and talented scientists don't have access to cleanroom facilities to design and fabricate their own MEMS-based microhotplates for the development of new chemical sensors. Now KMHP-100 microhotplates eliminate that prerequisite, and allow the scientists to focus their effort and talent on sensing materials development, which generally don't require MEMS expertise and cleanroom facility environment. For example, by using sol-gel process and micro-dispensing technique, such as a micropipette to deposit a micro-drop of the sensing material onto KMHP-100 microhotplate, new chemical sensors can be developed in a very short time period. The platinum microheater can also be used in-situ, to post-process the micro-deposited sensing material such as dehydrating, annealing sol-gels or curing polymers at temperatures up to 650°C.

Electrical Specifications

The thin-film resistive platinum micro-heater uses the Joule effect to convert electrical power into heating power. The micro-heater can be biased by a direct current (DC) voltage source or current source.
Figure 2 shows the temperature of the KMHP-100 microhotplate function of the thin-film platinum micro-heater applied electrical current.

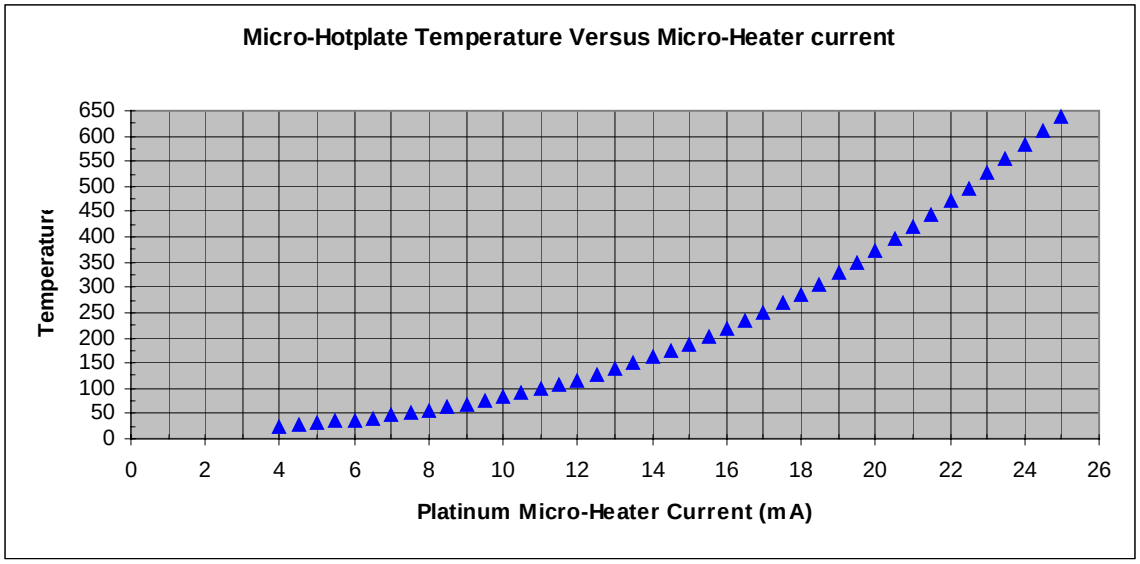

Figure 2. Temperature Versus Micro-Heater Current (mA)

Figure 3 shows the temperature of the KMHP-100 microhotplate function of the thin-film platinum micro-heater applied electrical voltage.

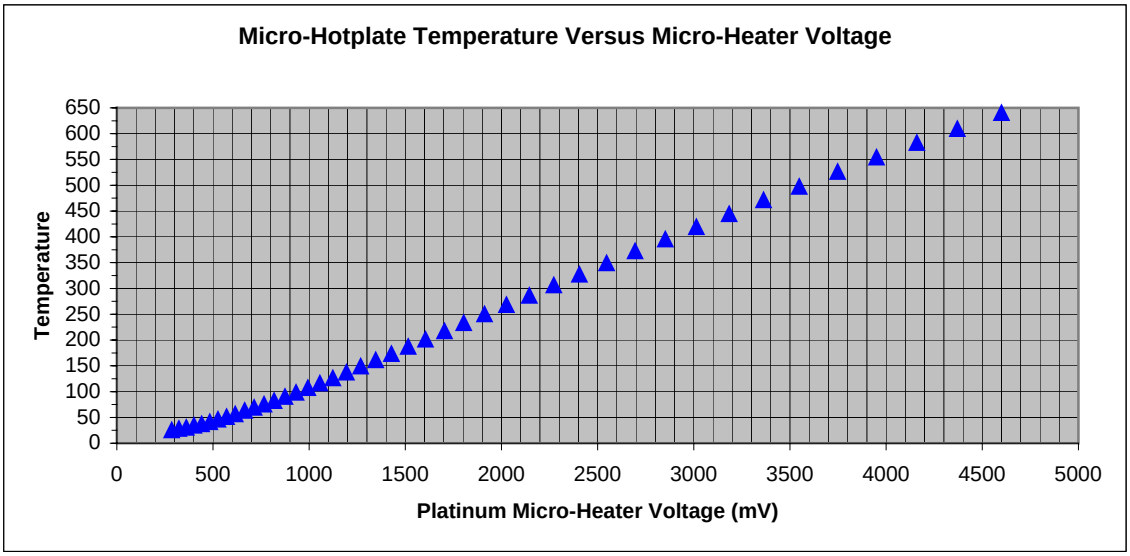

Figure 3. Temperature Versus Micro-Heater Voltage (mV)

Figure 4 shows the temperature of the KMHP-100 microhotplate function of the thin-film platinum micro-heater applied electrical power.

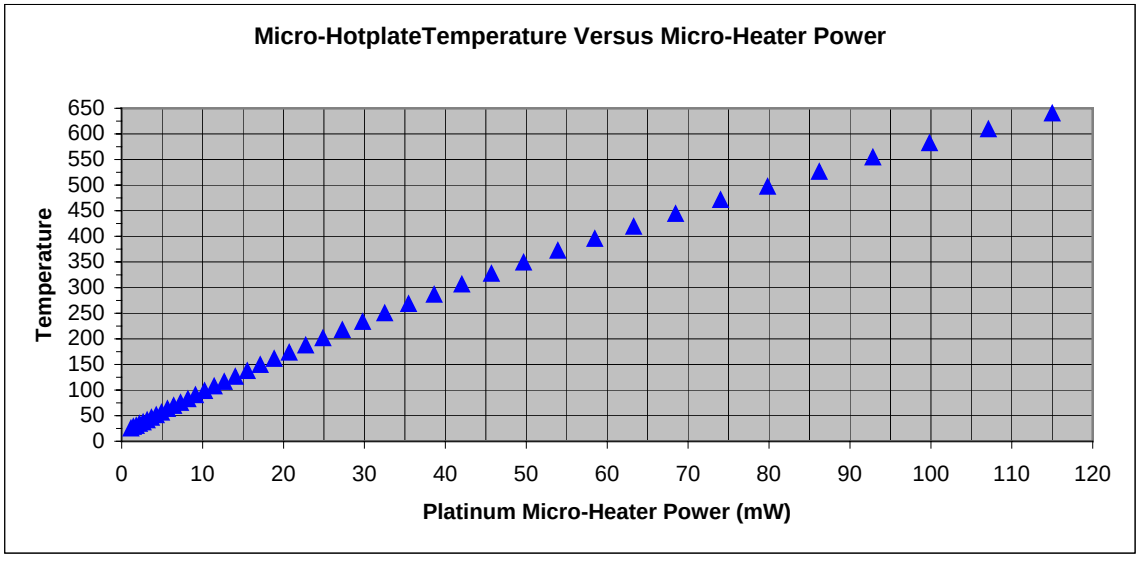

Figure 4. Temperature Versus Micro-Heater Power (mW)