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Ver.6 (EN)

AccuPaste™
CNT Heating Paste

Creating a New Era of Nano with CNT Heating Paste

- *AccuPaste*™ CNT Heating Paste is composed of high-performance carbon nanotube materials
- Creates high heat generation with low voltage and thin coating layer
- Maintains stable heat characteristics at high temperatures (maximum temp: 320℃)
- High electrical and thermal conductivity performance applicable to electrode and heat-generating materials

Bioneer Corporation is Korea's leading biotech company.
Bioneer is the first Korean biotechnology company when it was established in 1992.

AccuPaste™ CNT Heating Paste

Product Descriptions

- A coating layer maintains the heat-resisting property under high-temperature environment (maximum 320℃) unlike the general heating paste.
- The temperature elevation rate of *AccuPaste*™ CNT Heating Paste is faster than the sheath heater comprised of an existing Ni-Chrome resistance wire, and its electric efficiency is excellent at low voltage.
- The heat generated by CNT Heating Paste causes less air pollution, noise and radiation.
- *AccuPaste*™ CNT Heating Paste's application can be classified into heat generation materials based on high heat conductivity, ESD/EMI shielding material based on electric conductivity, and the transparent conductive film for the touch screen.
- High heat-generating *AccuPaste*™ CNT Heating Paste applies to the manufacture of high-temperature heating devices and constant-temperature heating devices. It is suitable for premium products that require slimness and sophisticated design.
- *AccuPaste*™ CNT Heating Paste meets the demands and requirements for new high-functional materials due to existing limitations of heating materials.

The Features of *AccuPaste*™ CNT Heating Paste

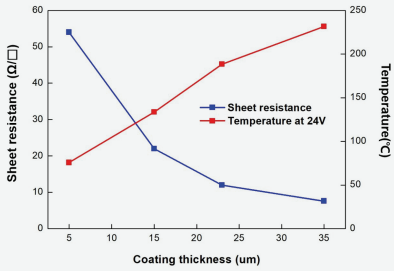
- CNT nano-material has an excellent dimensional stability with a lower Coefficient of thermal expansion value (α: -2 ~ +5 X 10^{6} K^{-1}) compared to the other existing materials.
- Provides high stability against most chemicals and solvents.
- There is no biological infringement or blazing fire.
- The electromagnetic wave shielding function in *AccuPaste*™ CNT Heating Paste shields the electromagnetic waves produced during energization, and heating hardly affects the human body.
- The high thermal conductivity and far-infrared radiation capability enable the heating of an expansive space by instantaneous heat generation and far-infrared radiation.
- Far-infrared has a physiological activity effect because of the resonance effects through water molecules existing in the living body.
- The high heat generating property can be used as a heating device material or an industrial heating material.

Specification of Product

Specification	TC-1005	TC-1010	TC-1000	TC-1020	TC-1030	Measurements /Methods
Main component	Ceramic Resin	Ceramic Resin	Ceramic Resin	Ceramic Resin	Ceramic Resin	
Appearance	Black	Black	Black	Black	Black	Visual Inspection
Workable temperature	-20 - 320℃	-20 - 320℃	-20 - 320℃	-20 - 320℃	-20 - 320℃	
Approximate Viscosity (cP)	80,000	230,000	230,000	80,000	160,000	Rotational Rheometer
Drying condition	30 min at 300℃	30 min at 300℃	30 min at 300℃	30 min at 300℃	30 min at 300℃	Hot-air drying
Sheet resistance (Ω/□)	About 7.5 x 10^{0} (coating thickness: 35 μm)	About 2.5 x 10^{1} (coating thickness: 10 μm)	About 7.0 x 10^{1} (coating thickness: 10 μm)	About 1.8 x 10^{2} (coating thickness: 10 μm)	About 6.0 x 10^{2} (coating thickness: 17 μm)	ASTM D991
Volume resistivity (Ω·m)	2.6 x 10^{-4}	2.5 x 10^{-4}	7.0 x 10^{-4}	1.8 x 10^{-3}	1.1 x 10^{-2}	ASTM D991
Storage conditions	Room temp.	Room temp.	Room temp.	Room temp.	Room temp.	Sealing

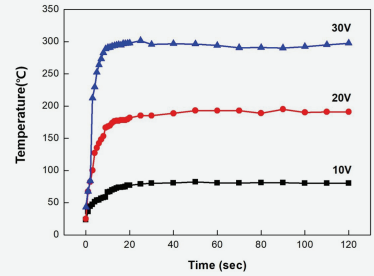
1. Properties of *AccuPaste*™ CNT Heating Paste (TC-1005)

1-1. Comparison of sheet resistance and heat characteristics with change in coating thicknesses.



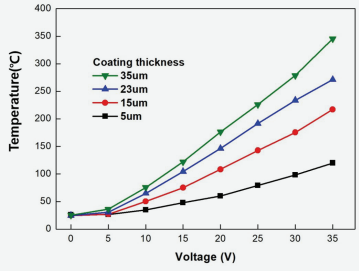
- This graph compares sheet resistance and temperature in dependence of the change in coating thicknesses at a low voltage of 24V.
- The result shows low sheet resistance with high heating rate as the coating thickness increased.

1-2. The temperature change over time at 10V, 20V, and 30V.



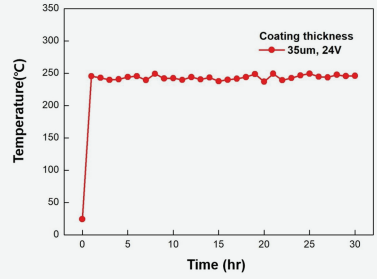
- The graph shows the temperature change over time at 10V, 20V, and 30V (coating thickness: 35 μm).
- This result shows that temperature is affected by voltage rise. Also, the peak temperature was reached within 30 seconds for each voltage.

1-3. Heat release test of the coating layers with change in voltage.



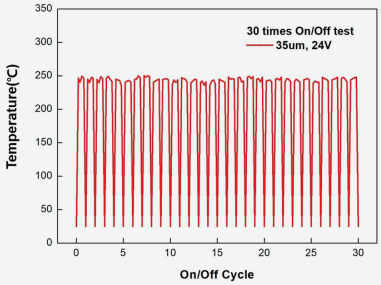
- The graph shows the temperature change over applied voltage in coatings with different thicknesses.
- The result showed that the heating rate increased as the coating thickness and applied voltage.

1-4. Temperature stability over time.



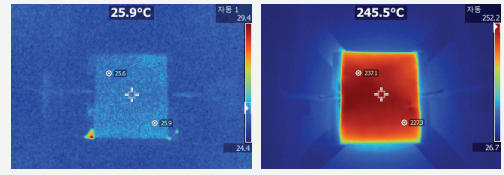
- The graph shows the temperature change of the coating layer (30 μm) over 30 hours at 24V.
- The temperature reached 245℃ within 30 seconds and, the surface temperature of the coating layer maintained at around 245℃ for 30 hours.

1-5. Temperature stability during the On/Off cycle.



- The graph shows the temperature stability of the 35 μm coating surface applied with 24V during the 30 on/off cycles.
- The result shows that the surface temperature of the 35 μm coating maintained at 245℃ during the 30 on/off cycles.

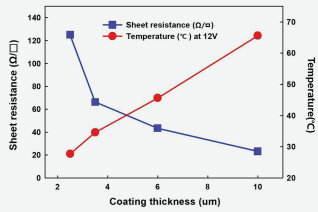
1-6. Heat release test of 35 μm CNT coating at 24V



- *AccuPaste*™ CNT Heating Paste: before heating (left) and after heating (right)

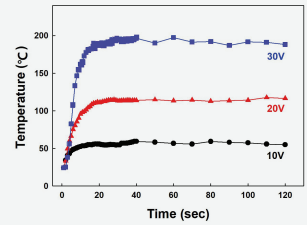
2. Properties of *AccuPaste*™ CNT Heating Paste (TC-1010)

2-1. Comparison of sheet resistance and heating characteristics with change in coating thicknesses.



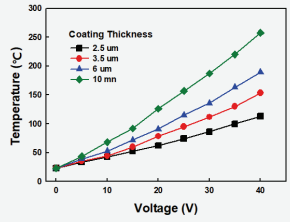
- This graph compares sheet resistance and heating rate with change in coating thicknesses at a low voltage of 12V.
- The result shows low sheet resistance with high heating rate as the coating thickness increased.

2-2. The temperature change over time at 10V, 20V, and 30V.



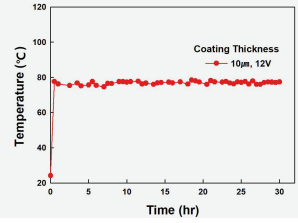
- The graph shows the temperature change over time at 10V, 20V, and 30V (coating thickness: 10 μm).
- This result shows that the temperature is affected by voltage rise. Also, the peak temperature reached within 20 seconds for each voltage.

2-3. Heat release test of the coating with change in voltage.



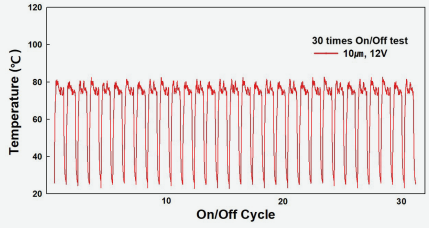
- The graph shows the temperature change over applied voltage in coatings with different thicknesses.
- The result shows that the heating temperature increased as the coating thickness and applied voltage.

2-4. Temperature stability over time.



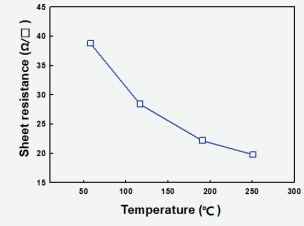
- This graph shows the temperature change of the coating layer (10 μm) over 30 hours at 12V.
- The temperature reached 76°C within 20 seconds and, the surface temperature of the coating maintained at around 76°C for 30 hours.

2-5. Temperature stability during the On/Off cycle.



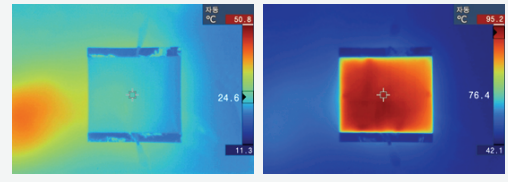
- The graph shows the temperature stability of the 10 μm coating surface applied with 12V during the 30 on/off cycles.
- As the result, the surface temperature maintained at about 76°C during the 30 on/off cycle tests

2-6. NTC (Negative Temperature Coefficient of Resistance) characteristics



- This result shows that sheet resistance decreased as the temperature rises, indicating that CNT Heating Paste has NTC characteristics.

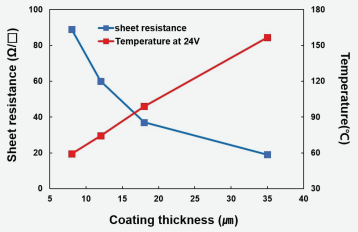
2-7. Heat release test of 10 μm CNT paste coating at 12V



- *AccuPaste*™ CNT Heating Paste: before heating (left) and after heating (right)

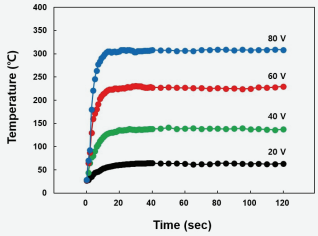
3. Properties of *AccuPaste*™ CNT Heating Paste (TC-1000)

3-1. Comparison of sheet resistance and heating characteristics with change in coating thicknesses.



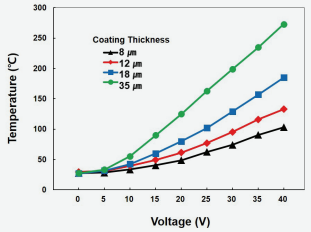
- This graph compares sheet resistance and heating rate with change in coating thicknesses at 24V.
- The result shows low sheet resistance with high heating rate as the coating thickness increased.

3-2. The temperature change over time at 20V, 40V, 60V and 80V.



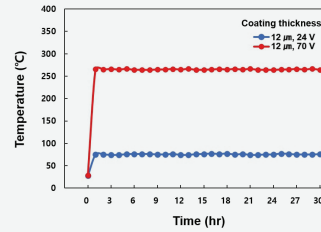
- The graph shows the temperature change over time at 20V, 40V, 60V and 80V (coating thickness: 12 μm).
- This result shows that the temperature is affected by voltage rise. Also, the peak temperature was reached within 30 seconds for each voltage.

3-3. Heat release test of coating with change in voltage.



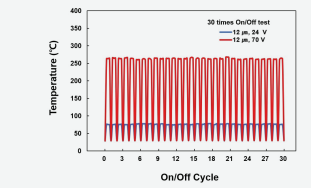
- This graph shows the temperature change over applied voltage in coatings with different thicknesses.
- The result proved that the heating rate increased as the coating thickness and applied voltage.

3-4. Stability test of temperature varying with over time.



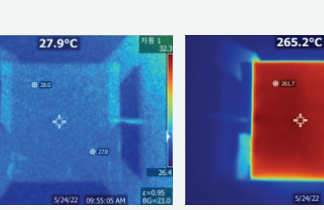
- The graph shows the temperature change for about 30 hours at each 24V voltage and 70V voltage when the coating thickness is 12 μm.
- According to the results, after reaching 70℃ and 250℃ within 30 seconds at each 24V voltage and 70V voltage, it can be seen that temperature is maintained constantly for about 30 hours.

3-5. Stability test of temperature varying with On/Off cycle.



- The graph shows the temperature stability of the 12 μm coating surface applied with 24V and 70V during the 30 on/off cycles.
- As shown in the result, the surface temperature of the 12 μm coating surface maintained at 70°C and 250°C during the 30 on/off cycles.

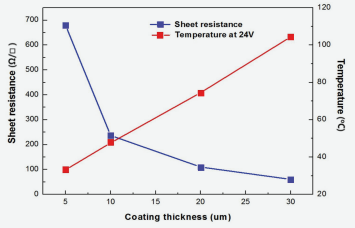
3-6. Heat release test of 12 μm CNT coating at 70V



- *AccuPaste*™ CNT Heating Paste: before heating (left) and after heating (right)

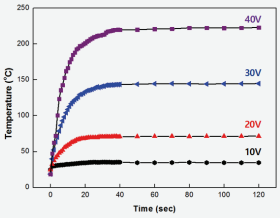
4. Properties of *AccuPaste*™ CNT Heating Paste (TC-1020)

4-1. Comparison of sheet resistance and heating characteristics with change in coating thicknesses.



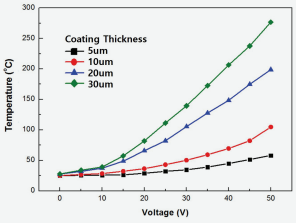
- This graph compares sheet resistance and heating rate with change in coating thicknesses at a low voltage of 24V.
- The result shows low sheet resistance with high heating temperature as the coating thickness increased.

4-2. The temperature change over time at 10V, 20V, 30V and 40V.



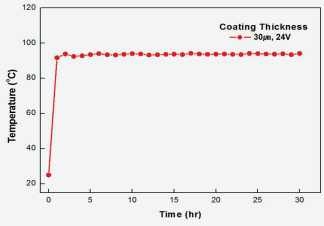
- The graph shows the temperature change over time at 10V, 20V, 30V and 40V (coating thickness: 30 μm)
- The result shows that the temperature is affected by voltage rise. Also, the peak temperature reached within 20 seconds for each voltage.

4-3. Heat release test of the coating with change in voltage.



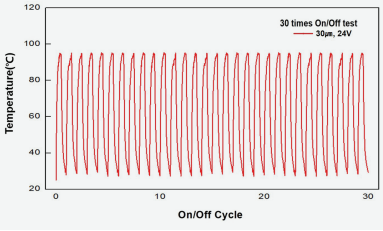
- The graph shows the temperature change over applied voltage in coatings with different thickness.
- The result proved that the heating rate increased as the coating thickness and applied voltage.

4-4. Temperature stability over time.



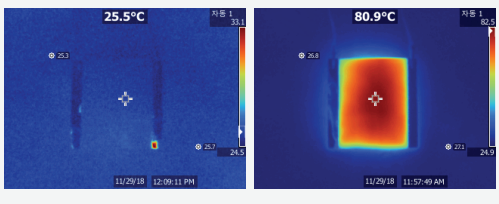
- The graph shows the temperature change of the coating layer (30 μm) over 30 hours at 24V.
- The temperature reached 91°C within 20 seconds and, the surface temperature of the coating maintained at around 91°C for 30 hours.

4-5. Temperature during the On/Off cycle.



- The graph shows the temperature difference of the 30 μm coating surface applied with 24V during the 30 on/off cycles.
- The result shows that the surface temperature of the 30 μm coating maintained at 91°C during the 30 on/off cycles.

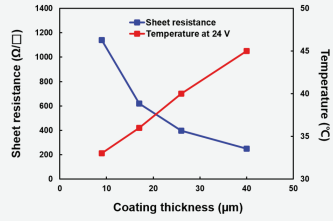
4-6. Heat release test of 30 μm CNT coating at 24V.



- *AccuPaste*™ CNT Heating Paste: before heating (left) and after heating (right)

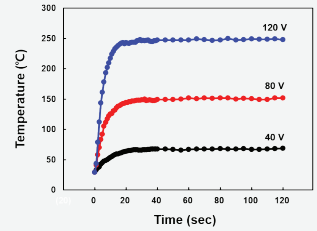
5. Properties of *AccuPaste*™ CNT Heating Paste (TC-1030)

5-1. Comparison of sheet resistance and heating characteristics with change in coating thicknesses.



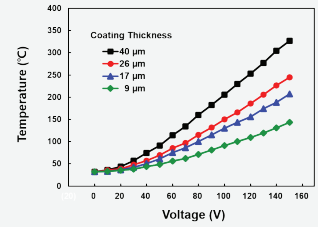
- This graph compares sheet resistance and heating rate with change in coating thicknesses at a low voltage of 24V.
- The result shows low sheet resistance with high heating temperature as the coating thickness increased.

5-2. The temperature change over time at 40V, 80V and 120V.



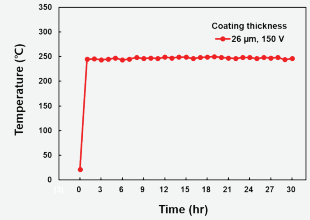
- The graph shows the temperature change over time at 40V, 80V and 120V (coating thickness: 40 μm)
- The result shows that the temperature is affected by voltage rise. Also, the peak temperature reached within 30 seconds for each voltage.

5-3. Heat release test of the coating layers with change in voltage.



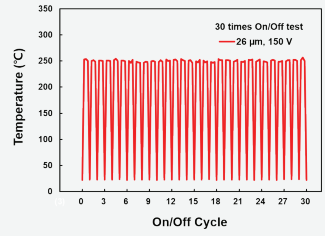
- The graph shows the temperature change over applied voltage in coatings with different thicknesses.
- The result showed that the heating rate increased as the coating thickness and applied voltage.

5-4. Temperature stability over time.



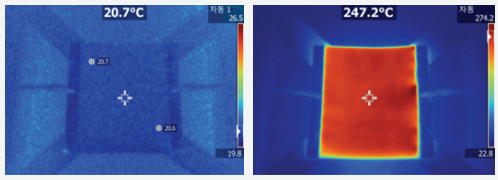
- The graph shows the temperature change of the coating layer (26 μm) over 30 hours at 150V.
- The temperature reached 248℃ within 30 seconds and, the surface temperature of the coating layer maintained at around 248℃ for 30 hours.

5-5. Temperature stability during the On/Off cycle.



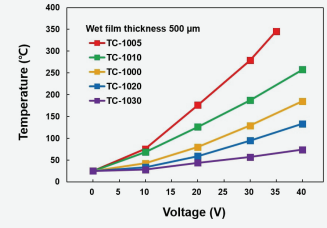
- The graph shows the temperature stability of the 26 μm coating surface applied with 150V during the 30 on/off cycles.
- The result shows that the surface temperature of the 26 μm coating maintained at 248℃ during the 30 on/off cycles.

5-6. Heat release test of 26 μm CNT coating at 150V



- *AccuPaste*™ CNT Heating Paste: before heating (left) and after heating (right)

5-7. A comparison of heat characteristics in TC-1005, TC-1000, TC-1010, TC-1020 and TC-1030.



- The result shows the temperature change with voltage for the wet film (thickness: 500 μm).

Ordering Information

Cat. No.	Products description	Size	Price
AccuPaste™ CNT Heating Paste,10 Ohm (TC-1005)			
TC-1005-1	CNT Heating Paste, 10 Ohm	100 ml	$ 257
TC-1005-2	CNT Heating Paste, 10 Ohm	500 ml	$ 458
TC-1005-3	CNT Heating Paste, 10 Ohm	1 L	$ 743
AccuPaste™ CNT Heating Paste, 25 Ohm (TC-1010)			
TC-1010-1	CNT Heating Paste, 25 Ohm	100 ml	$ 198
TC-1010-2	CNT Heating Paste, 25 Ohm	500 ml	$ 352
TC-1010-3	CNT Heating Paste, 25 Ohm	1 L	$ 572
AccuPaste™ CNT Heating Paste, 75 Ohm (TC-1000)			
TC-1000-1	CNT Heating Paste, 75 Ohm	100 ml	$ 180
TC-1000-2	CNT Heating Paste, 75 Ohm	500 ml	$ 320
TC-1000-3	CNT Heating Paste, 75 Ohm	1 L	$ 520
AccuPaste™ CNT Heating Paste, 200 Ohm (TC-1020)			
TC-1020-1	CNT Heating Paste, 200 Ohm	100 ml	$ 190
TC-1020-2	CNT Heating Paste, 200 Ohm	500 ml	$ 344
TC-1020-3	CNT Heating Paste, 200 Ohm	1 L	$ 564
AccuPaste™ CNT Heating Paste, 600 Ohm (TC-1030)			
TC-1030-1	CNT Heating Paste, 600 Ohm	100 ml	$ 190
TC-1030-2	CNT Heating Paste, 600 Ohm	500 ml	$ 340
TC-1030-3	CNT Heating Paste, 600 Ohm	1 L	$ 560

*Please contact our Technical Support for bulk orders.

Legal Statement

AccuPaste™ CNT Heating Paste technology is covered under Korea patent 10-1447478, 10-1613503 and its corresponding international patent application.

Technical Support and Ordering

To ask any detailed product information or place an order, please e-mail nano-support@bioneer.com

Contact Us

BIONEER
Innovation • Value • Discovery

Bioneer Corporation
8-11 Munpyeongseo-ro, Daedeok-gu
Daejeon, 34302, Republic of Korea
Tel: +82-42-930-8777 (Korea: 1588-9788)
Fax: +82-42-930-8688
E-mail: sales@bioneer.com

Bioneer Inc.
155 Filbert St. Suite 216
Oakland, CA 94607, USA
Toll Free: +1-877-264-4300
Fax: +1-510-865-0350
E-mail: order.usa@bioneer.us.com

Bioneer R&D Center
Korea Bio Park BLDG #B-702
700 Daewangpangyo-ro, Bundang-gu, Seongnam-si
Gyeonggi-do, 13488, Republic of Korea
Tel: +82-31-628-0500
Fax: +82-31-628-0555