



## DSC measurement of thermochromic ink

2009.03

### Summary

- Thermochromic ink contains a color fixative, a color-developing agent, and a thermochromic compound in a microcapsule. The complex formed upon combining the color fixative and the color-developing agent is colored at room temperature.
- When the temperature of the ink reaches or exceeds the setting temperature  $T_A$  of the thermochromic compound, the mixture becomes colorless because the thermochromic compound inhibits binding of the color fixative and the color-developing agent. Therefore, thermochromic ink is used as an erasable ink that can be erased by frictional heat. When the temperature of the ink reaches the setting temperature  $T_B$  during cooling, the ink returns to its original color.
- Differential scanning calorimetry (DSC) enables the detection of an endothermic peak associated with binding/dissociation of the color fixative and color-developing agent.

## Results

### Samples

Three kinds of green color ink

- Water-based ink
- Oil-based ink
- Thermochromic ink

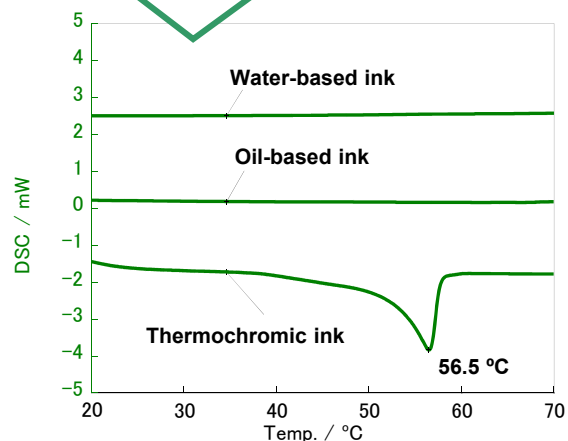
### Measurement conditions

Sample weight: 5 mg  
 Heating and cooling rate: 5 °C/min  
 Purge gas: Nitrogen

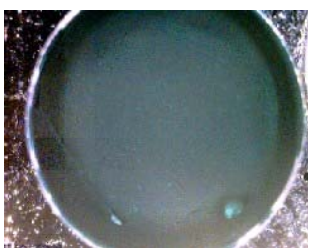


Differential Scanning Calorimeter  
DSC7020 system

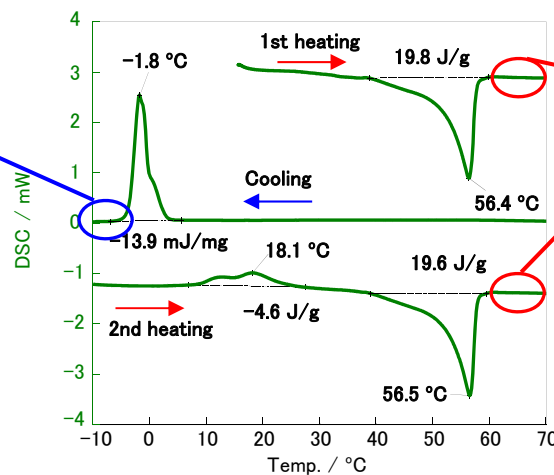
An endothermic peak appears at 56 °C only for the thermochromic ink.



DSC curves of green inks



When the temperature of the thermochromic ink is lowered to  $T_B$  (around -2 °C) or below, the ink returns to its original green color.



DSC curve of thermochromic ink



When the temperature of the thermochromic ink reaches or exceeds  $T_A$  (56 °C), the ink becomes colorless.