

Thermal Analysis of Polyvinyl Chloride Slip-proof Sheet

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Slip-proof sheets, which have high durability and anti-slipping properties, are produced from various kinds of polymeric composite materials. The characteristics of composite materials are determined by the characteristics of the component materials, e.g., their phase change and thermal decomposition characteristics.

Polymeric materials are often characterized using TG/DTA and DSC. However, by combining these methods with Real View TA, changes in composite materials during heating/cooling can now also be observed visually.

In this brief, we introduce a thermal analysis using TG/DTA and DSC coupled with Real View TA of a slip-proof sheet made from PVC and polyester core threads.

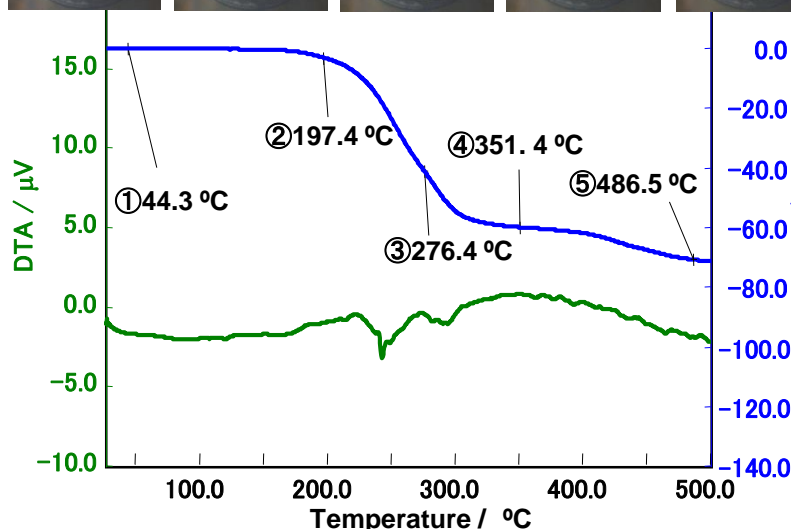


Slip-proof Sheet

Results



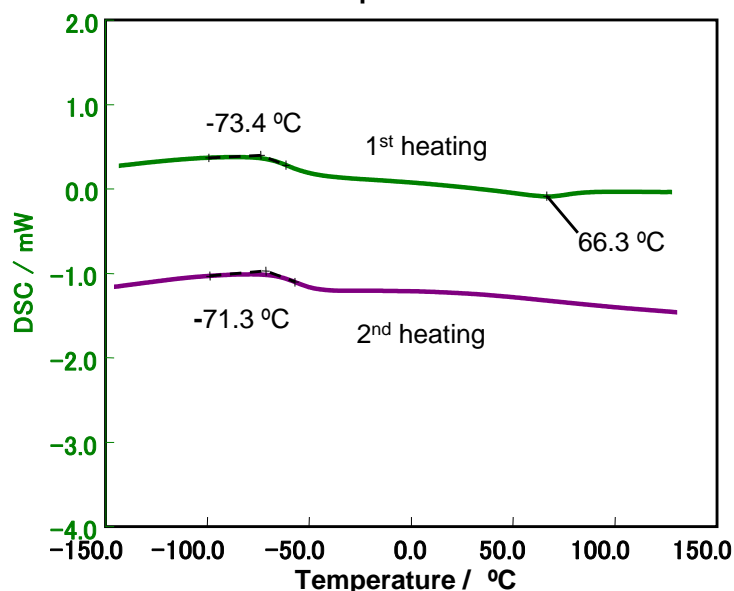
- Analyzer: STA7220 + Real View TA sample observation unit
- Sample weight: Around 5 mg
- Heating rate: 10 °C/min
- Sample pan: Al open pan
- Atmosphere: N₂ 200 mL/min



The TG plot shows the two-stage thermal decomposition behavior of the main component, PVC, from ambient temperature to 500 °C.

Based on images obtained by the Real View sample observation unit, the PVC begins to flow at 197 °C ②. The sample darkens throughout the gradual mass reduction that occurs ③. We believe that this color change is due to hydrocarbons formed by the dehydrochlorination of PVC.

Melting of the polyester cannot be detected with certainty from the DTA or from the real-time images since the thermal decomposition temperature of PVC and the melting temperature of polyester overlap.



- Analyzer: DSC7000X
- Sample weight: Around 5 mg
- Heating rate: 10 °C/min
- Sample pan : Al open pan (crimped)
- Atmosphere: N₂ 50 mL/min

A glass transition is observed around -73 °C, which is lower than for normal PVC. This indicates that this PVC contains softening agents that raise the glass transition temperature.

During the 1st heating, a broad endothermic peak appears at 66 °C.

This peak does not appear during the 2nd heating, which suggests volatilization of the added agent or thermal relaxation of the polyester orientation.

Thermal decomposition reactions or glass transitions of PVC slip-proof sheets can be evaluated by TG/DTA and DSC. Moreover, the Real View TA provides visual observation of the thermal decomposition processes.