

Thermal Analysis of Copier Toners

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1. Introduction

Copy machines generally use toner developers which consists of thermosoftening resins mixed with carbon black. The properties of these toners basically depend upon the characteristics of the thermosoftening resins.

This brief describes data obtained from DSC measurements of glass transition points for several toner resins. Data from quantitative TG/DTA analysis of carbon black is also described.

2. Methods and Data

2-1 DSC Measurement

Figure 1 shows DSC measurement result for four types of toner resins. A baseline shift caused by the glass transition can be observed in all of the samples at around 60°C coupled with endothermic reactions due to thermal history. Sample ④ also shows the presence of an endothermic peak at about 125°C.

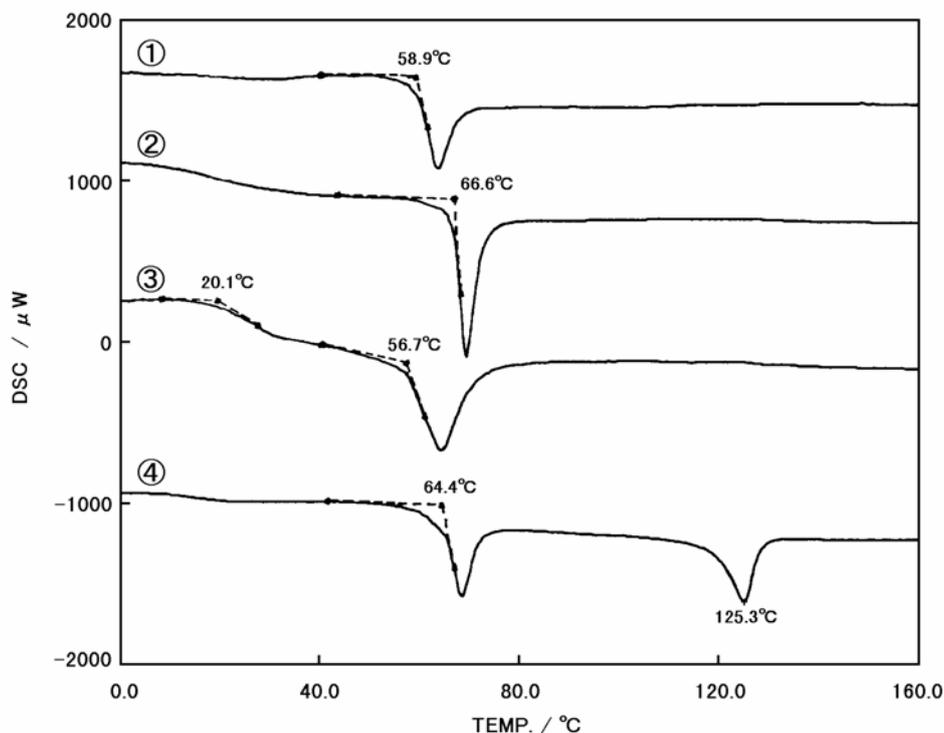


Figure 1 DSC Curves for Copier Toner Resins (1st heating)

Sample weight : 5mg

Heating rate : 10°C/min

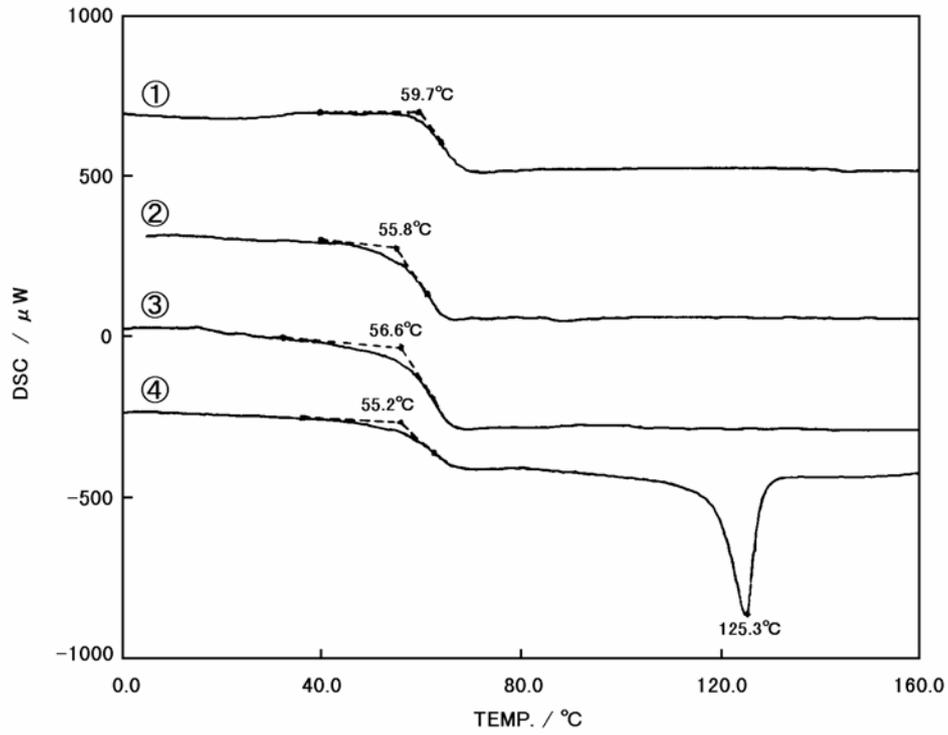


Figure 2 DSC Curves for Copier Toner Resins (2nd heating)
 Sample weight : 5mg
 Heating rate : 10°C/min

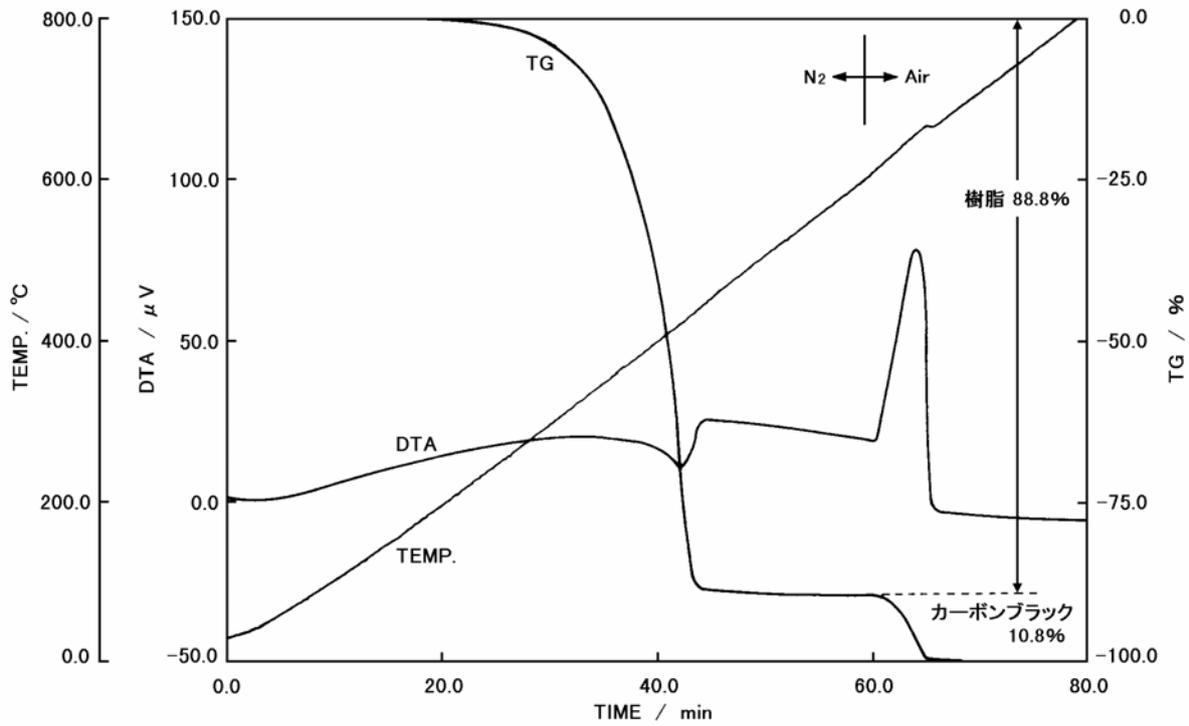


Figure 3 TG/DTA Curves for Copier Toner Resin
 Sample weight : 5mg
 Heating rate : 10°C/min

Figure 2 shows the results obtained from a second heating of the sample after cooling from the first heating. In this figure only baseline shifts appear, without the thermal history induced glass transition endothermic peaks which were visible in Figure 1. Sample ④ again shows an endothermic peak at 125°C, which is attributable to the fusion of polyethylene that has been added to the toner resin.

2-2 TG/DTA Measurement

Figure 3 shows TG/DTA measurement results of a toner. During measurement the atmospheric flow gas was changed from N₂ to air at 600°C. The weight loss that took place in N₂ corresponds to the carbon black. The weight ratio of toner components can be read from these curves; i.e., resin : 88.8%, carbon black : 10.8% and inorganic materials : 0.4%.

3. Summary

As described above, DSC and TG/DTA analysis provide effective means for analysis of toner glass transition points and component ratios.