Application Note B-TA1015

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TA1015 - Oxidative decomposition of HDPE

Introduction

The material's thermo-physical properties can be estimated based on the reaction temperature and reaction percentage from the measurement results but the information on the changes in physical appearance is unknown. However, in some cases, "how does the sample appearance changes due to the reaction" is a concern. Even in the past, the information on observing the sample taken out from thermal analyzer after the experiment is useful to understand the results. Using the sample observation thermal analysis, we can grasp the sample's color and shape change and interpret the thermal analysis data by associating the reaction with the changes in appearance. Here, the change in color and shape when HDPE (High-density polyethylene) was oxidatively decomposed in air atmosphere was measured by sample observation TG-DTA.

Measurement and results

The measurement results of sample observation TG-DTA in HDPE is shown in Figure 1.

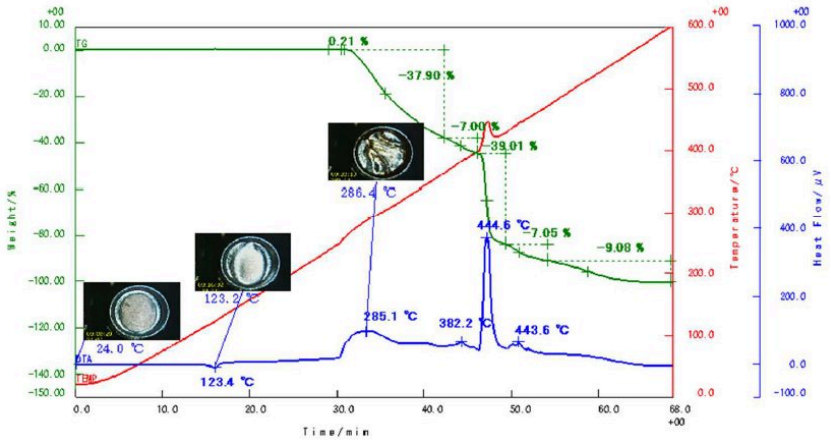

Figure 1: Sample observation TG-DTA measurement results in HDPE (4 mg, 10℃/min heating rate; air atmosphere)

Results show that an endothermic peak due to melting can be observed at 123℃. The TG shows a gradual mass loss due to oxidative decomposition from 260℃, followed by an oxidative decomposition corresponding exothermic peaks can be seen in DTA. In addition, a mass increase due to surface oxidation be confirmed at 240℃. Then the sample was totally decomposed when it was heated up to 600℃. In the sample observation thermal analysis, the image at any point on the thermal analysis data can be displayed.

Figure 2 shows the sample observation image at different temperatures points (start, peak top and at 600℃).

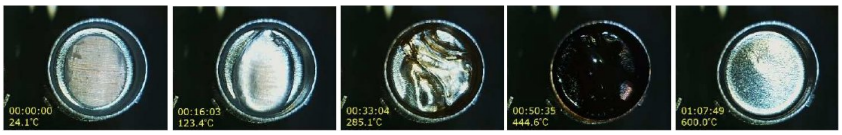

Figure 2: Sample observation images at different temperature points

From the sample observation images, the different changes in sample state due to melting, discoloration, carbonization during decomposition, combustion of carbonized sample and total disappearance can be confirmed, respectively. All sample image results can also be confirmed as a video linked to the thermal analysis data.