Application Note B-TA1028

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TA1028 - Thermal behavior of biodegradable plastic straw by STA

Introduction

Recently, due to the increased environmental problems brought by the use of petroleum-based plastics, research and development efforts for the production and use of biodegradable polymers have recently increased. Poly(3-hydroxybutyrate-co-3-hydroxyhexanoate) (PHBH) is one of the common sources of biodegradable polymers which is produced thru fermentation by microorganisms that uses plant oils as raw material. PHBH is a member of the PHA family. Here, we measured the thermal behavior of a biodegradable straw made of PHBH using the sample observation STA.

Measurement and results

A 4 mm in diameter sheet weighing 3mg was prepared and placed in an Al pan. It loaded onto a sample observation STA8122 and was measured from RT~600℃ heating at 20℃/min in air atmosphere flowing at 300 ml/min.

The STA measurement results with the sample observation images are shown in Figure 1. Results indicate that on the DTA curve a slight change in heat flow can be detected at 150℃ which may be mistaken as a noise if measured without a sample observation option. The sample images at 131℃ and 160℃ show that the sample color changed from white to transparent which clearly indicates a solid to liquid transformation due to melting. PHBH is known to have a low crystallinity that explains the small endothermic peak during melting. Then at 240℃, the material starts to lose its mass which is associated with an exothermic peak. Here, the sample image changes from transparent to light brown revealing oxidation reaction at 290℃, followed with intense change to dark color indicating thermal decomposition near 300℃ associated with mass loss and an endothermic reaction. Then a 100% mass loss is observed at 500℃.

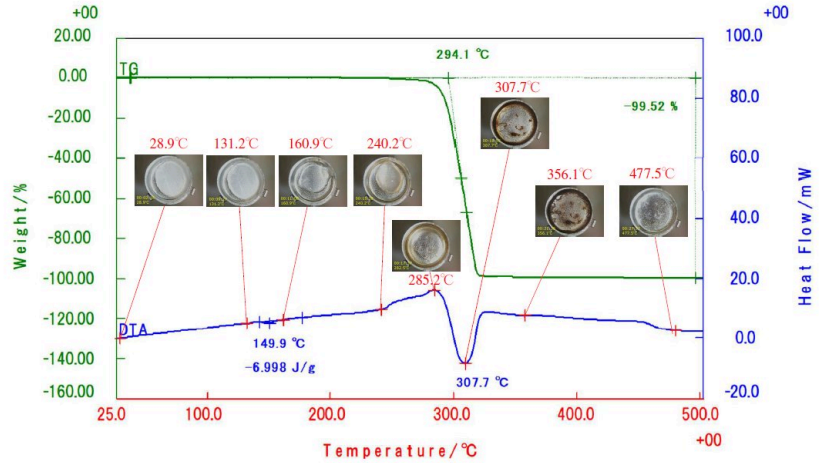

Figure 1: Measurement result of PHBH by sample observation STA (TG-DSC)

Reference

J. Li, et. al. 2019. *BioResources* **14**(1), 1219-1228