

Characterization of Polymers Using TGA

W.J. Sichina, Marketing Manager

Introduction

Thermogravimetric analysis (TGA) is one of the members of the family of thermal analysis techniques used to characterize a wide variety of materials. TGA provides complementary and supplementary characterization information to the most commonly used thermal technique, DSC.

TGA measures the amount and rate (velocity) of change in the mass of a sample as a function of temperature or time in a controlled atmosphere. The measurements are used primarily to determine the thermal and/or oxidative stabilities of materials as well as their compositional properties. The technique can analyze materials that exhibit either mass loss or gain due to decomposition, oxidation or loss of volatiles (such as moisture). It is especially useful for the study of polymeric materials, including thermoplastics, thermosets, elastomers, composites, films, fibers, coatings and paints.

TGA measurements provide valuable information that can be used to select materials for certain end-use applications, predict product performance and improve product quality. The technique is particularly useful for the following types of measurements:

- Compositional analysis of multi-component materials or blends
- Thermal stabilities
- Oxidative stabilities
- Estimation of product lifetimes
- Decomposition kinetics
- Effects of reactive atmospheres on materials
- Filler content of materials
- Moisture and volatiles content

PerkinElmer offers a variety of high performance TGA instruments encompassing a wide range of application needs and operational requirements. All of the TGA instruments feature an optional, state-of-the-art autosampler for reliable, unattended operation.

The extended capabilities of the PerkinElmer TGA, as a valuable tool for polymeric characterization and quality assurance are demonstrated by these applications.

Thermal Stabilities and Moisture Content

Figure 1 shows the TGA results generated on nylon 6,6 toothbrush bristles. The plot shows the percent mass as a function of sample temperature for the nylon 6,6 bristles under a nitrogen purge. Approximately 10 mg of sample was heated at a rate of 30 C/min with the PerkinElmer TGA.

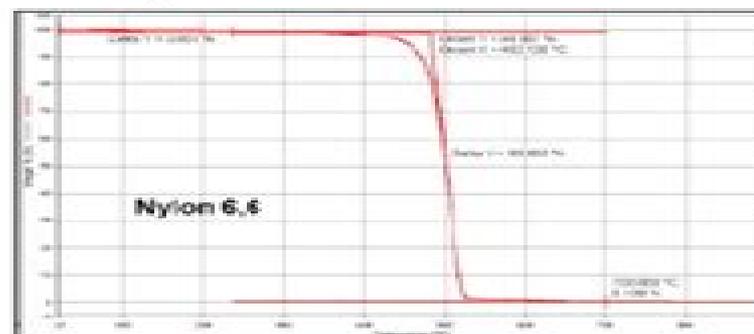


Figure 1. TGA results obtained for nylon 6,6 bristles showing thermal degradation.

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AW Chickering



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