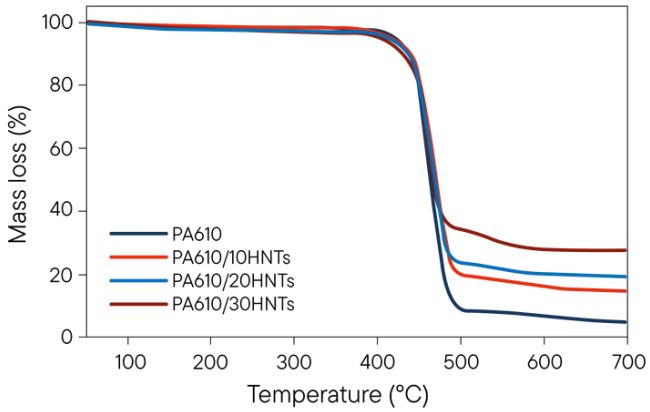
Thermal Stability of PA610/Halloysite Nanocomposites

TGA L83 Analysis of Biobased Polyamide Composites

Partially biobased polyamide 610 (PA610) offers an attractive basis for sustainable engineering materials. In this study, the LINSEIS TGA L83 was used to investigate the influence of halloysite nanotubes (HNTs) on the thermal stability of PA610 composites. The measurements enable direct comparison of degradation behavior and residual inorganic content at different HNT loadings.

Measurement Setup

- Instrument: LINSEIS TGA L83
- Material: PA610 with 0, 10, 20 and 30 wt.% HNTs
- Temperature Range: 30–700 °C
- Heating Rate: 10 °C/min
- Atmosphere: Air
- Sample Mass: 5–7.5 mg
- Measurement: Thermogravimetric Analysis (TGA)
- Application: Biobased Polymer Nanocomposites



The TGA curves show the characteristic degradation behavior of PA610 and the influence of increasing HNT content.

Key observations include:

- PA610 degradation starts above 400 °C
- Slightly improved thermal stability with 10 and 20 wt.% HNTs
- Highest degradation temperature of 466.6 °C for PA610/10HNTs
- Residual mass increases with HNT content

The residual masses at 700 °C closely correspond to the nominal HNT concentrations, demonstrating the suitability of TGA for evaluating filler content in polymer nanocomposites.

Interpretation

The observed behavior can be attributed to:

- High thermal stability of PA610
- Barrier effect of dispersed HNTs
- Increased inorganic filler content

This results in:

- Slightly improved thermal stability
- Reliable HNT content determination
- Optimized composite characterization

Industrial Relevance

Thermogravimetric Analysis supports:

- Biobased polymer development
- Polymer nanocomposites
- Filler content verification
- Thermal stability assessment
- Automotive components
- Sustainable engineering plastics

Conclusion

The LINSEIS TGA L83 enables reliable characterization of the thermal degradation behavior of partially biobased PA610/HNT composites. The measurements show that HNT incorporation can slightly improve thermal stability, with the highest degradation temperature observed for the composite containing 10 wt.% HNTs. At the same time, the increasing residual mass provides a direct indication of the incorporated inorganic filler content. TGA therefore provides valuable information for formulation development, material optimization and quality control of sustainable polymer nanocomposites.

Source:
Marset, D., Dolza, C., Boronat, T. et al.
Injection-Molded Parts of Partially Biobased Polyamide 610 and Biobased Halloysite Nanotubes.
Polymers, 2020, 12, 1503.
Adapted from thermogravimetric measurements performed using a LINSEIS TGA 1000 (now designated as LINSEIS TGA L83).