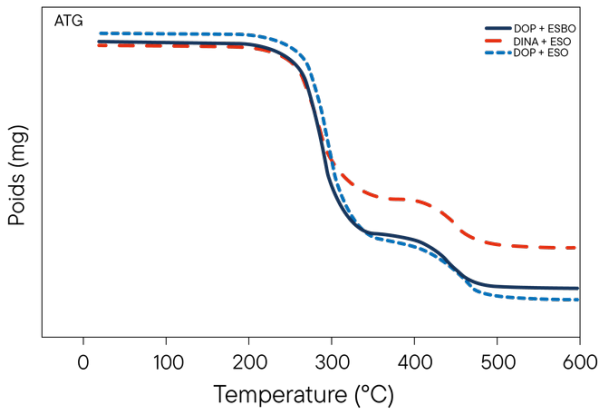
Thermal Stability of Naturally Weathered PVC Formulations

STA Analysis of Polymer Ageing and Degradation Behavior

Simultaneous Thermal Analysis (STA) enables the investigation of thermal stability and degradation processes in polymer materials. In this application example, naturally weathered plasticized PVC formulations were analyzed using the Linseis STA L81 (former designation: STA PT 1600). The measurement provides valuable insights into ageing effects and long-term material stability.

Measurement Setup

- Instrument: Linseis STA L81 (former designation: STA PT 1600)
- Sample: Naturally weathered plasticized PVC formulations
- Measurement: Thermogravimetric Analysis (TGA)
- Application: Polymer ageing and stability evaluation



The STA measurement reveals the influence of natural weathering on the thermal stability of the investigated PVC formulations.
Key observations include:

- Distinct thermal degradation behavior between formulations
- Onset of mass loss associated with PVC decomposition
- Improved thermal stability for selected stabilizer systems
- Multiple degradation stages during heating
- Clear differentiation of ageing effects through TGA analysis

The results demonstrate the suitability of TGA for evaluating long-term ageing behavior and thermal stability of polymer materials.

Interpretation

The observed thermal degradation behavior can be attributed to:

- Dehydrochlorination reactions within the PVC matrix
- Influence of stabilizer and plasticizer systems
- Structural changes caused by long-term weathering

This results in:

- Different thermal stability levels
- Varying degradation resistance
- Improved understanding of material lifetime

Industrial Relevance

STA measurements are widely used for:

- Polymer ageing studies
- Lifetime prediction
- Material qualification
- Stabilizer development
- Quality control of polymer formulations

Conclusion

The measurements performed with the Linseis STA L81 demonstrate the suitability of thermogravimetric analysis for evaluating the thermal stability of weathered PVC formulations. The results provide valuable information on degradation mechanisms and ageing behavior, supporting the development of durable polymer materials for long-term applications.

Source:
Hamitouche, F., Lardjane, N., Grohens, Y., Habchi Laribi, H., Belhaneche Bensemra, N. Natural Weathering of Plasticized Polyvinyl Chloride (PVC) Stabilized with Epoxidized Sunflower Oil. WSEAS Transactions on Environment and Development, 2022, 18, 417–426. DOI: 10.37394/232015.2022.18.41
Adapted from thermogravimetric measurements performed using a LINSEIS STA PT 1600 (current designation: STA L81).