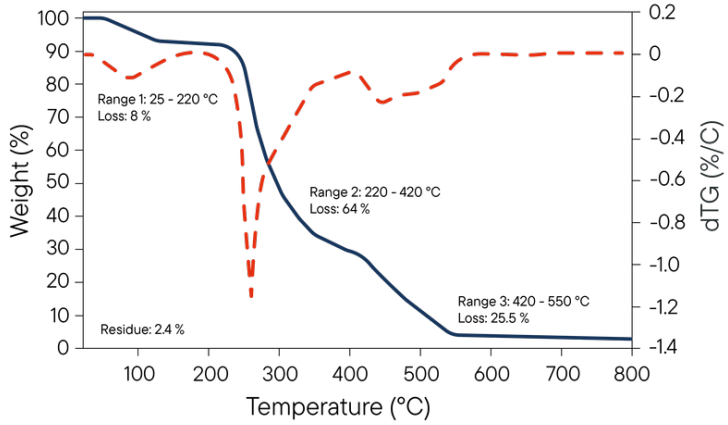
Thermal Stability of Tragacanth Gum for High-Voltage Lithium-Ion Batteries

Thermogravimetric Analysis (TGA) of a Sustainable Aqueous Binder

Thermogravimetric Analysis (TGA) enables the precise determination of mass changes as a function of temperature under controlled atmospheric conditions. In this application, Tragacanth Gum (TG), a natural polysaccharide binder for lithium-ion battery cathodes, was investigated to evaluate its thermal stability and suitability for electrode manufacturing. The measurement provides valuable information on moisture release, polymer degradation, oxidation behavior, and residual content.

Measurement Setup

- Instrument: Linseis TGA L81 (former designation: TGA PT 1600)
- Sample: Tragacanth Gum (TG)
- Atmosphere: Air
- Heating Rate: 10 K/min
- Temperature Range: 25 °C – 800 °C
- Measurement: Mass loss as a function of temperature



The TGA measurement reveals the thermal decomposition behavior of the investigated Tragacanth Gum binder material.
Key observations include:

- Initial mass loss below approximately 220 °C due to moisture evaporation
- Main decomposition stage between 220 °C and 420 °C
- Oxidation of remaining organic residues between 420 °C and 560 °C
- Low final residue of approximately 2.4 wt.% indicating high organic content

The low residual mass confirms the predominantly organic composition of the binder.

Interpretation

The observed mass loss can be attributed to:

- Moisture evaporation
- Polysaccharide decomposition
- Oxidation of organic residues

This results in:

- High thermal stability below 200 °C
- Suitable processing conditions for electrode manufacturing
- Low residual inorganic content

Industrial Relevance

TGA measurements are widely used for:

- Battery binder characterization
- Electrode material development
- Thermal stability assessment
- Process and drying optimization
- Sustainable battery manufacturing

Conclusion

The measurement performed with the Linseis TGA L81 (former designation: TGA PT 1600) demonstrates that Tragacanth Gum is a thermally stable and environmentally friendly binder for high-voltage lithium-ion battery cathodes. The material remains stable throughout relevant manufacturing temperatures and exhibits controlled decomposition only at elevated temperatures, making it a promising candidate for sustainable battery electrode production.

Source:
Versaci, D., Apostu, O. D., Dessantis, D., Amici, J., Francia, C., Minella, M., Bodoardo, S. Tragacanth, an Exudate Gum as Suitable Aqueous Binder for High Voltage Cathode Material. Batteries, 2023, 9(4), 199.
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Adapted from thermogravimetric measurements performed using a Linseis TGA L81 (former designation: TGA PT 1600).