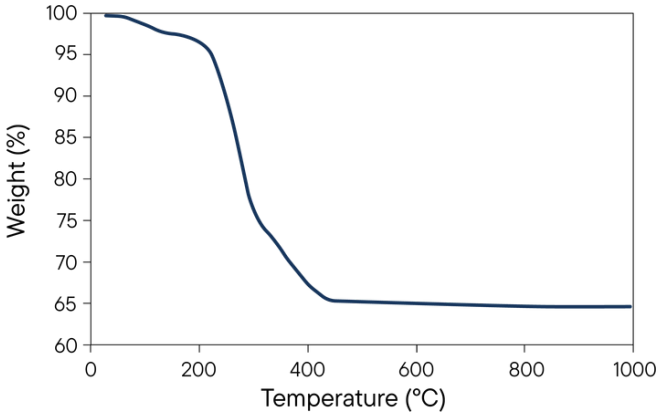
Thermogravimetric Analysis of LSCF Green Membranes

STA L81 Characterization of Binder Burnout During Ceramic Processing

Thermogravimetric Analysis (TGA) is an essential tool for optimizing ceramic manufacturing processes by accurately monitoring mass changes during heating. Precise identification of binder burnout temperatures enables the development of defect-free sintering profiles and improves the quality of advanced ceramic components. In this study, a LINSEIS STA L81 was used to investigate the thermal decomposition behavior of asymmetric LSCF green membranes prior to sintering.

Measurement Setup

- Instrument: LINSEIS STA L81
- Material: Asymmetric LSCF Green Membrane
- Temperature Range: Room Temperature to 1000 °C
- Atmosphere: Air
- Heating Rate: 2 K/min
- Measurement: Thermogravimetric Analysis (TGA)
- Application: Binder Burnout Optimization



The TGA measurement clearly identifies the temperature range in which the organic components are removed.

Key observations include:

- Continuous mass loss during heating
- Major weight reduction below 450 °C
- Stable mass above 450 °C
- Complete binder burnout before sintering

The results demonstrate the importance of controlled thermal treatment for defect-free ceramic processing.

Interpretation

The observed behavior can be attributed to:

- Thermal decomposition of organic binders
- Progressive removal of additives
- Controlled debinding process
- Stable ceramic residue

This results in:

- Optimized debinding profiles
- Reduced processing defects
- Improved sintering quality

Industrial Relevance

Thermogravimetric Analysis measurements support:

- Ceramic membrane manufacturing
- Debinding optimization
- Sintering process development
- Fuel cell components
- Oxygen transport membranes
- Advanced ceramic processing

Conclusion

The LINSEIS STA L81 enables precise monitoring of mass changes throughout the debinding process. Accurate identification of binder decomposition temperatures provides valuable information for optimizing thermal treatment profiles, reducing processing defects and improving the quality of advanced ceramic membranes and other high-performance ceramic components.

Source:
Fedeli, P., Drago, F., Schulze-Küppers, F., Baumann, S.
Asymmetric LSCF Membranes Utilizing Commercial Powders.
Materials, 2020.
Adapted from thermogravimetric analysis (TGA) measurements performed using a LINSEIS STA L81 (formerly designated as STA PT 1600).