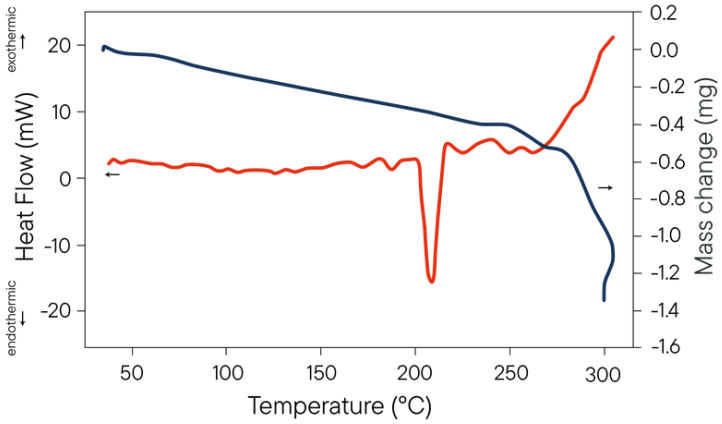
Thermal Analysis of Solid Acid Electrolytes for Fuel Cell Applications

Simultaneous Thermal Analysis of the $Rb_3H(SO_4)_2$–$RbHSO_4$ System

Simultaneous Thermal Analysis (STA) enables the combined measurement of mass change and heat flow under controlled temperature conditions. In this application example, a solid acid electrolyte system consisting of $Rb_3H(SO_4)_2$ and $RbHSO_4$ was investigated using the former instrument designation STA PT 1600, now known as the Linseis STA L81.
The measurement provides valuable information about phase transitions, reaction behavior and thermal stability of proton-conducting materials for fuel cell applications.

Measurement Setup

- Instrument: Linseis STA L81 (former designation: STA PT 1600)
- Sample: 66.67% $RbHSO_4$ – 33.33% $Rb_3H(SO_4)_2$ mixture
- Atmosphere: Ambient air
- Heating Rate: 2 K/min
- Temperature Range: Ambient to 300 °C
- Measurement: Simultaneous mass change and heat flow determination



The STA measurement reveals the thermal behavior of the investigated proton-conducting solid acid system.
Key observations include:

- Phase transition at approximately 170 °C
- Intermediate phase formation near 182 °C
- Disproportionation reaction around 202 °C
- Dehydration process beginning near 250 °C
- Mass loss associated with water release

The measurement demonstrates the complex thermal behavior of proton-conducting solid acid materials.

Interpretation

The observed thermal events can be attributed to:

- Phase transitions
- Intermediate phase formation
- Dehydration processes

This results in:

- Changes in material structure
- Reduced stability at elevated temperatures
- Valuable insights for electrolyte development

Industrial Relevance

STA measurements are widely used for:

- Fuel cell electrolyte characterization
- Proton-conducting material development
- Thermal stability evaluation
- Investigation of phase transition behavior
- Energy materials research
- Hydrogen technology applications

Conclusion

The measurement performed with the Linseis STA L81 demonstrates the suitability of simultaneous thermal analysis for investigating phase transitions, reaction behavior and thermal stability of solid acid electrolytes. The combination of mass change and heat flow information provides valuable insights for the development of advanced fuel cell and hydrogen technologies.

Source:
Kowalski, C. P., Chaijaroen, P., Kaewniyom, F.
Thermal behavior of solid acids in the $Rb_3H(SO_4)_2$–$RbHSO_4$ system under ambient atmosphere.
Journal of Metals, Materials and Minerals, 2021, 31(1), 57–63.
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Adapted and extended with measurements performed on a Linseis STA L81 (former designation: STA PT 1600).