TIMA® 5

Thermal Interface Material Analyzer
Model 5

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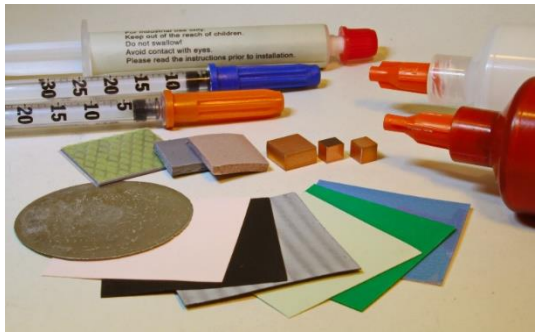
Beyond ASTM D 5470

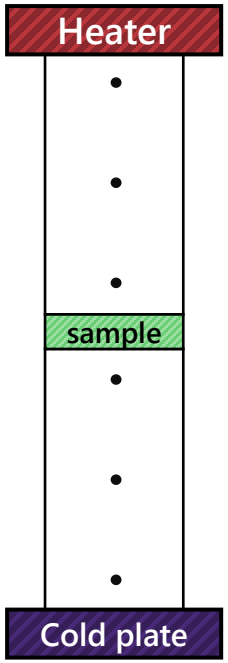
- Effective and bulk thermal conductivity
- Thermal effective and interface resistance
- Compact all-in-one system



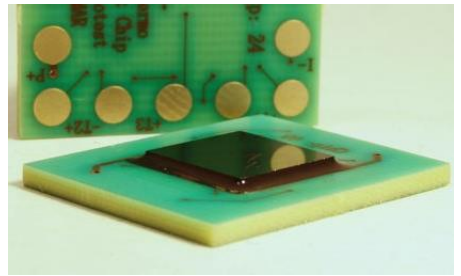
examples of feasible material samples

Feasible samples

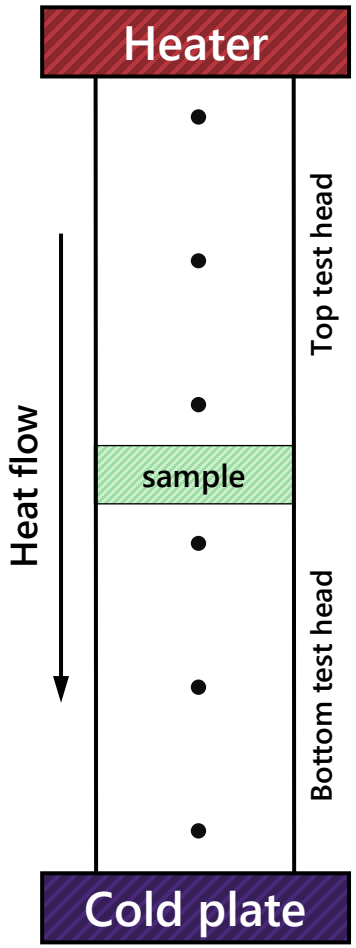
- Thermal interface material
- Die attach materials
- Underfill materials
- Molding compound
- Substrates
- Foils
- Multilayer samples

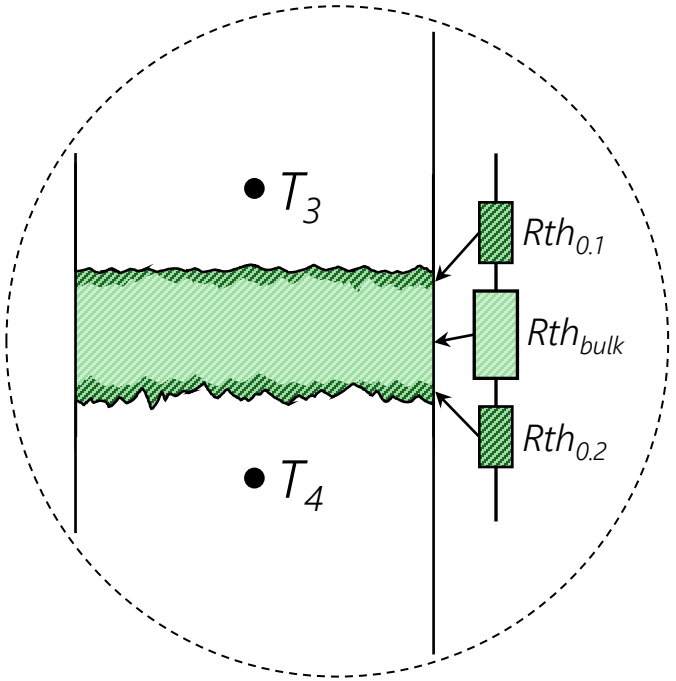


selection of available test heads



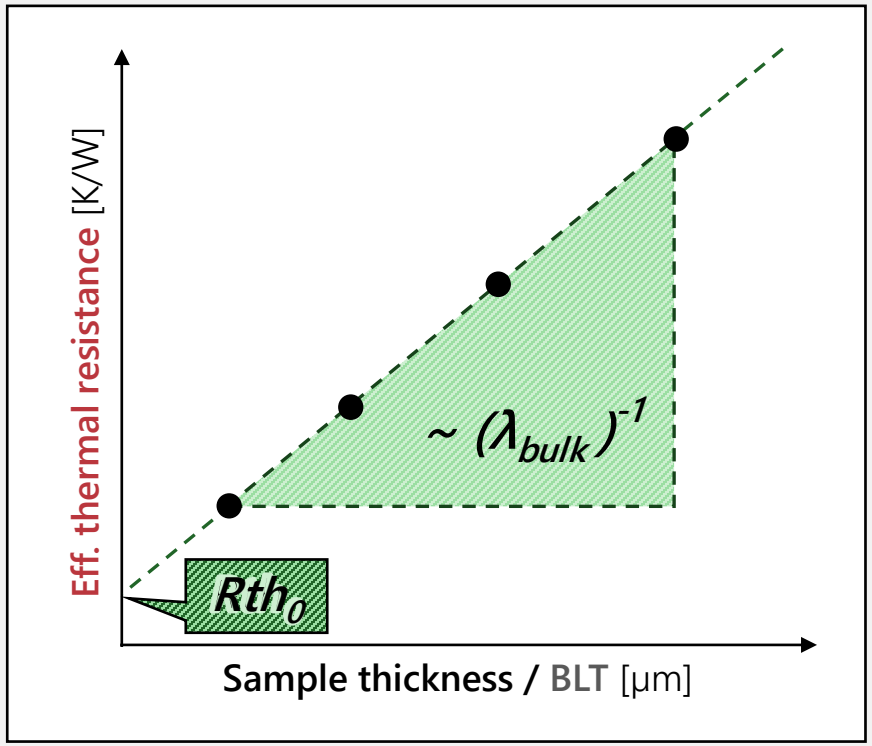
test chip for
application-related studies





$$Rth_{eff} = Rth_{bulk} + Rth_0$$

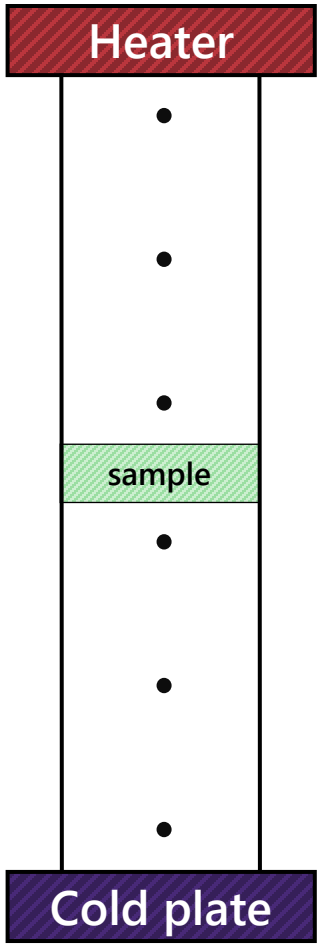
$$Rth_{eff} = \frac{\Delta T}{\dot{Q}}$$



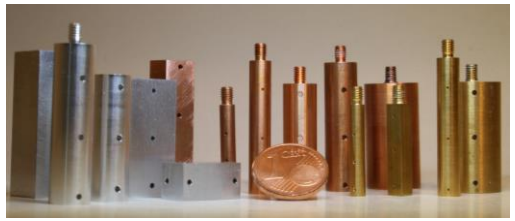
$$Rth_{eff} = \frac{1}{\lambda_{bulk} \cdot A} \cdot BLT + Rth_0$$

*The linear fit of thermal resistance over the thickness bears information about **bulk thermal conductivity** and **interface resistance**.*

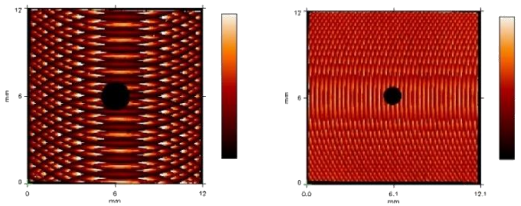
» Testing under application-related or customer-specific conditions



Test heads



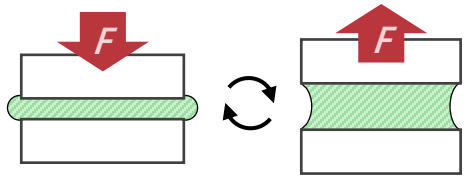
Various **test heads material**s allow to mimic contacting surfaces from real application cases



Manipulation of **surface coating** and **roughness** brings the test setup even closer to real application

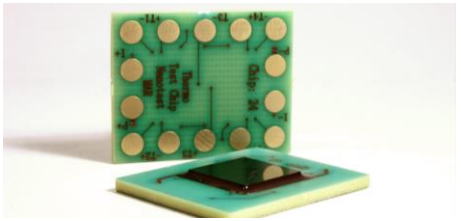
Beyond the scope

Specialized **curing tools** for external sample curing under any sample-specific condition

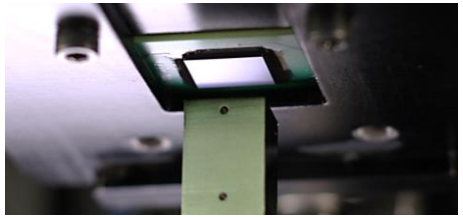


In-situ testing of **aging behavior**, lifetime expectancy and reliability of TIM under recurring loads

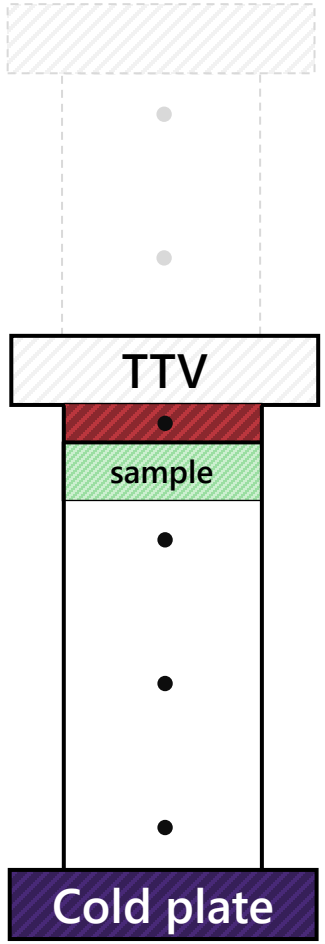
TIM1 testing



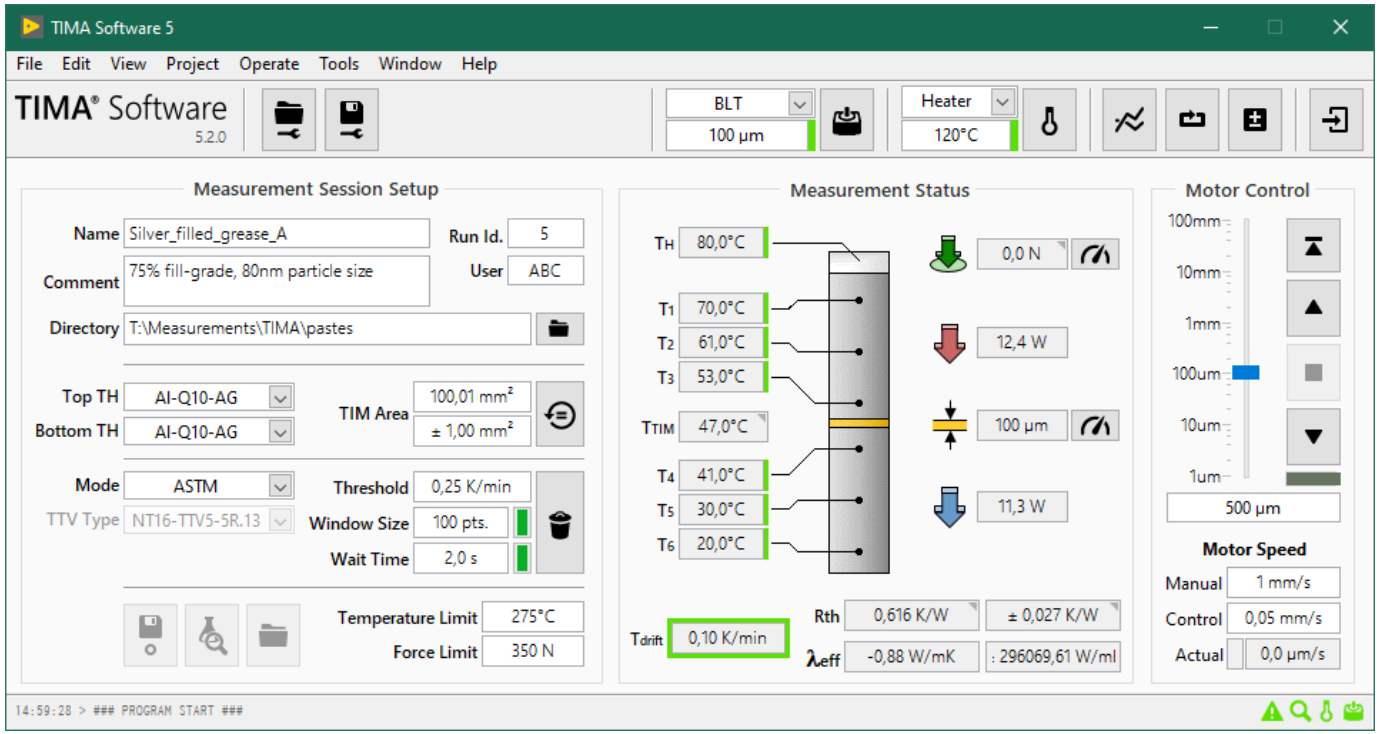
The **use of a TTV** instead of a metal top test head creates a typical TIM1 scenario

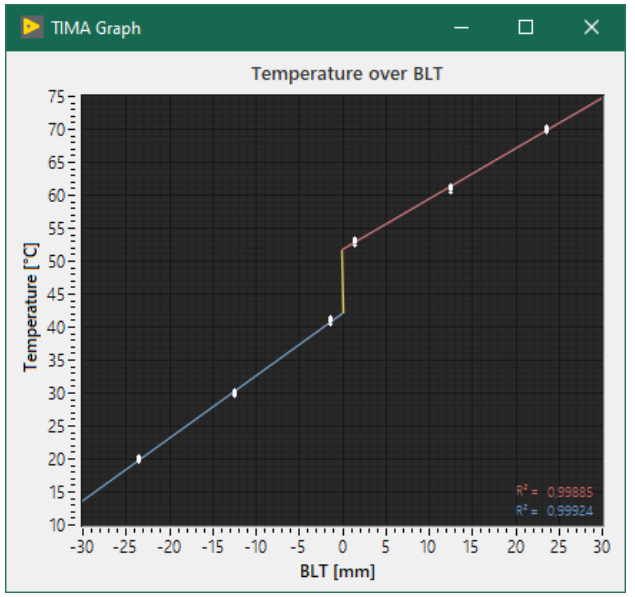


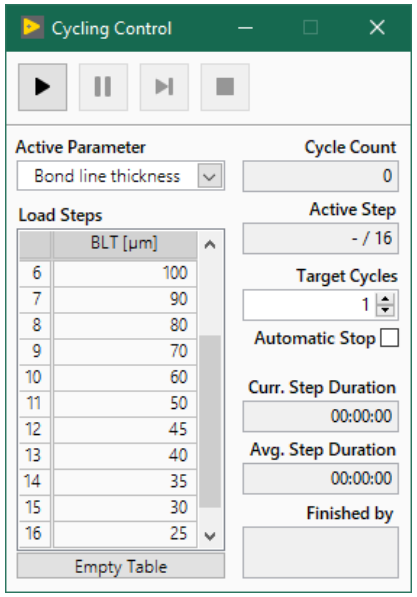
Interior of TIMA 5 is at any time **easily accessible** to always visually observe what is happening

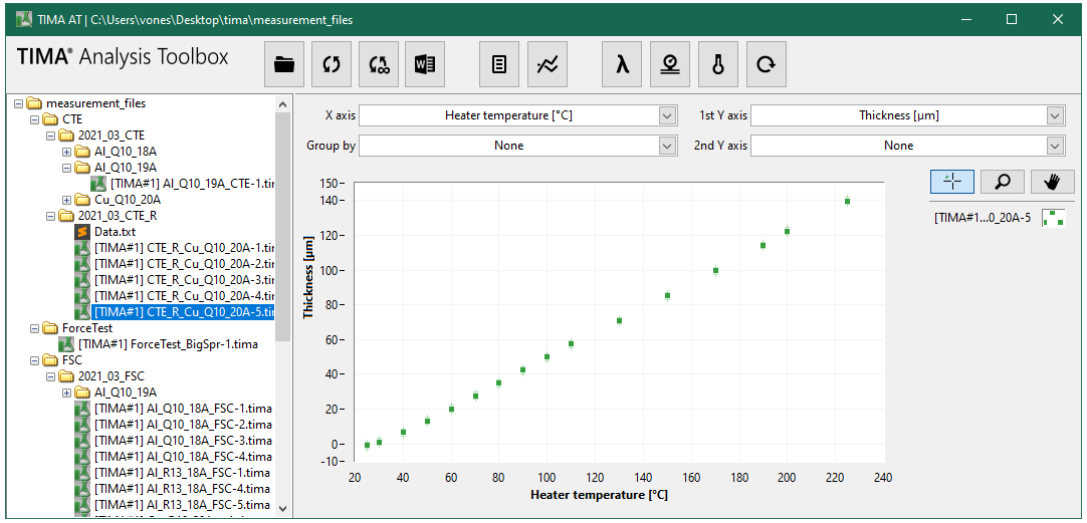


TIMA® 5 Graphical User Interface









- Live measurement monitoring
- Full measurement setup control
- Measurement setup save and restore
- Quick measurement results review
- Lean and intuitive design

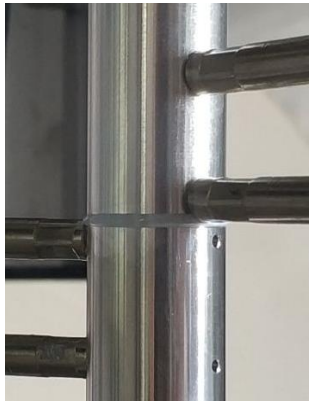
Measurement examples

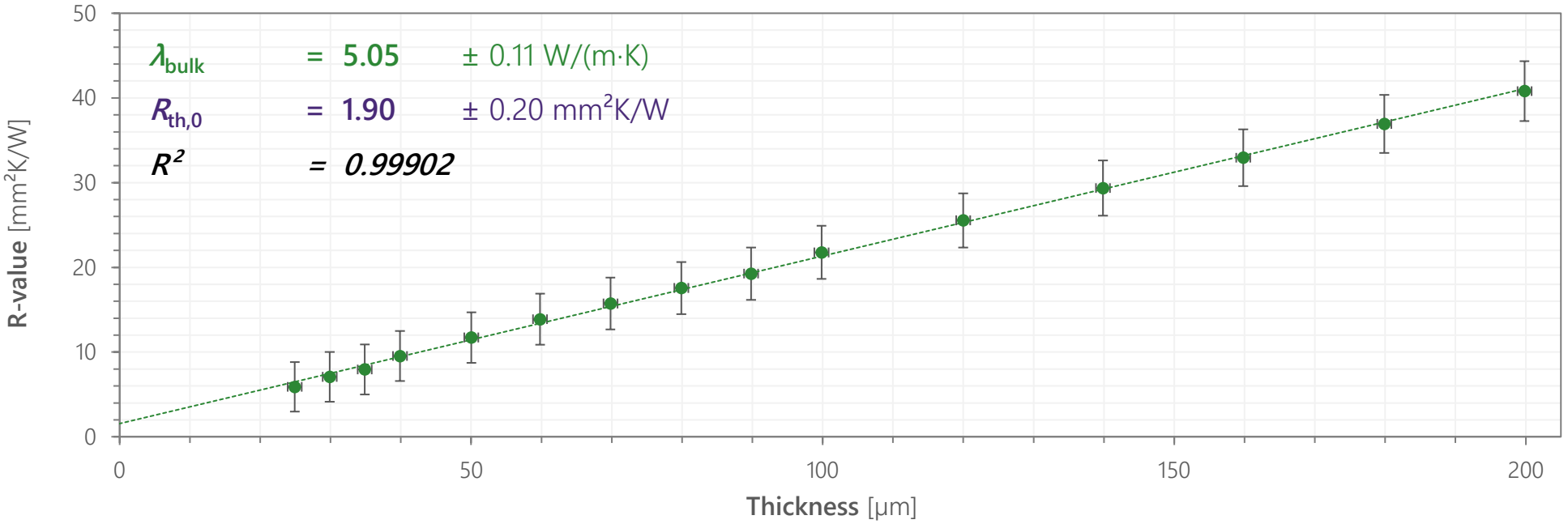
TIMA® 5 in action

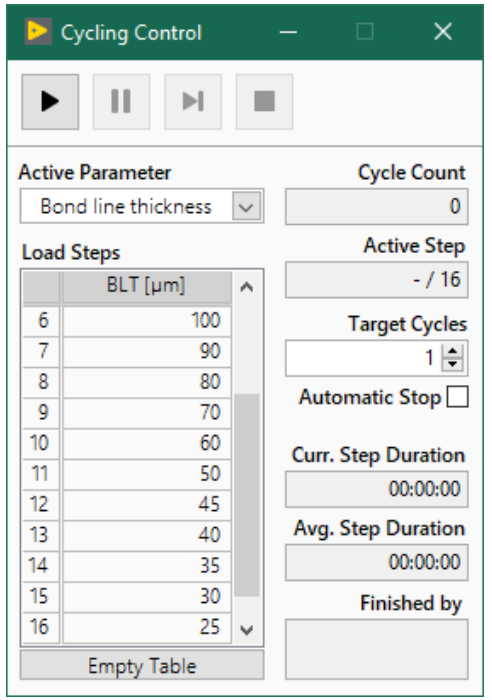
Characterization of thermal grease

Silver-filled polymer

- R-value vs. thickness
  → Bulk thermal conductivity and contact resistance
- Thickness range 25 to 200 µm
  → Automatic scheduled measurement







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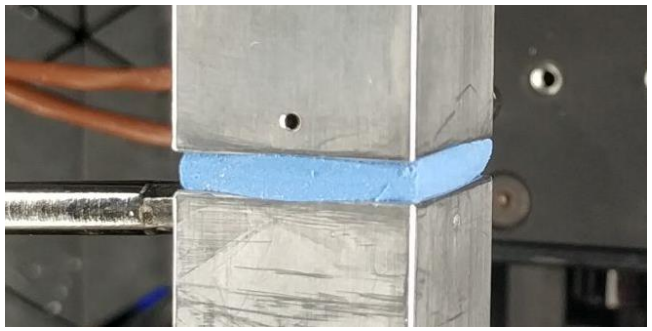
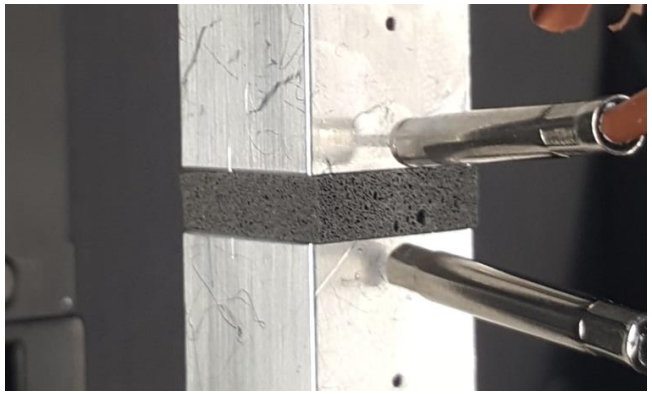
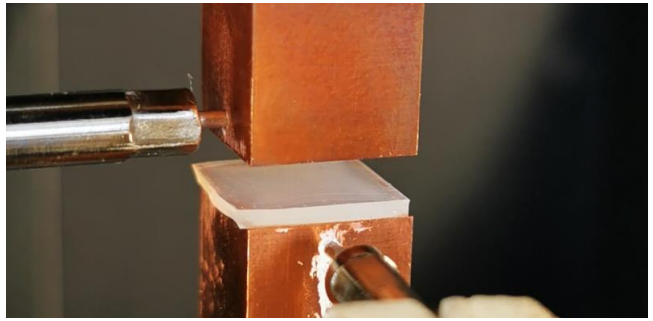
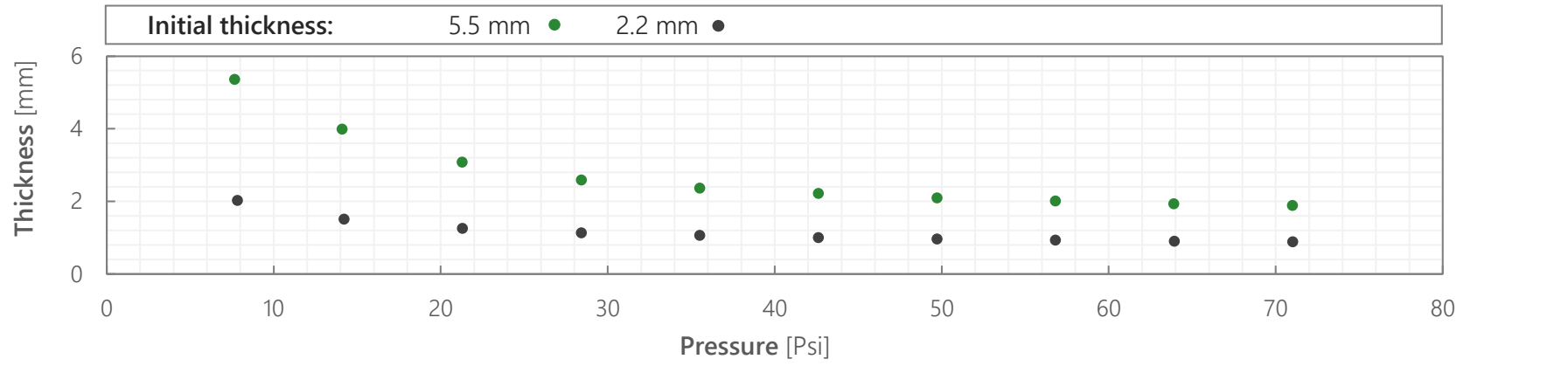
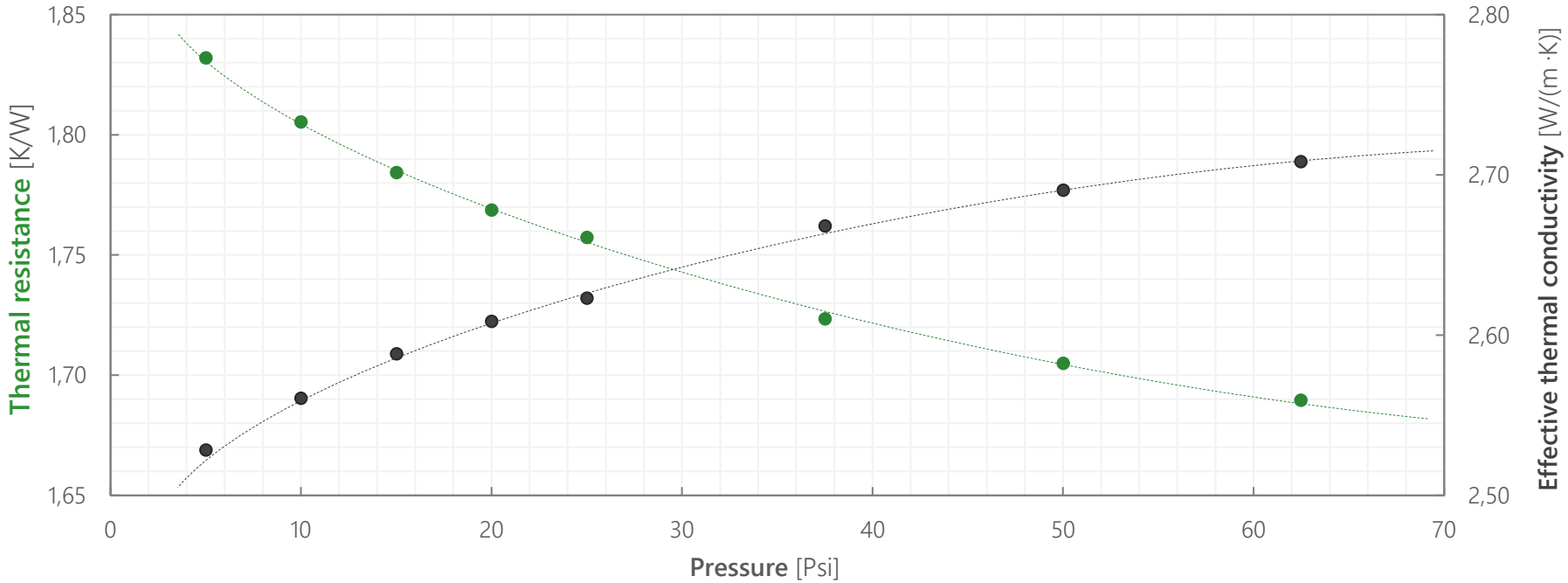
Characterization of soft material











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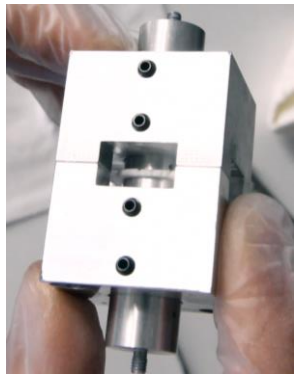
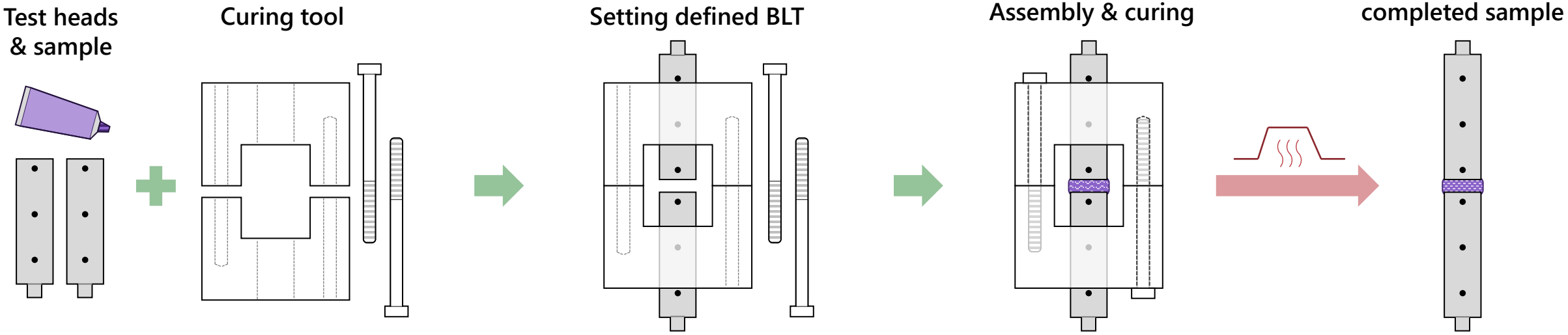
Preparation of cured samples

External curing of samples for measurement in TIMA

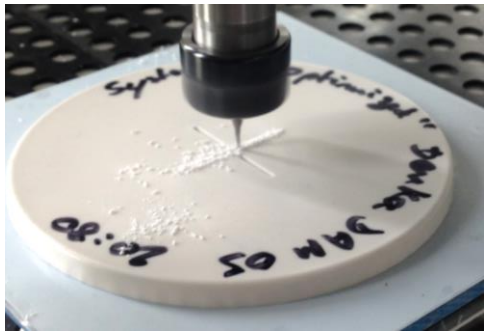
- Low-stress bond lines
- Defines bond line thicknesses
- Easy assembling and disassembling



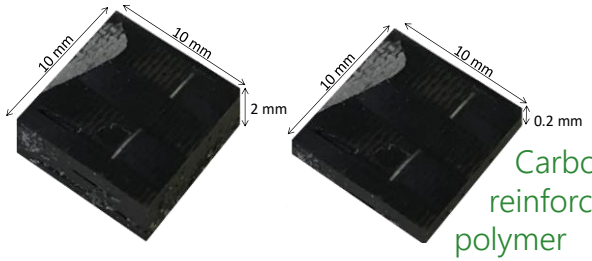


Thermal characterization of pre-cured polymer

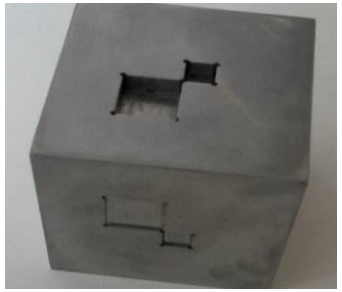
- Bulk thermal conductivity determined by measurements at different thicknesses
- **ASTM D5470 conformant**
- **Iterative thinning** and measurement of same sample
- Characterization of **pre-cured samples**



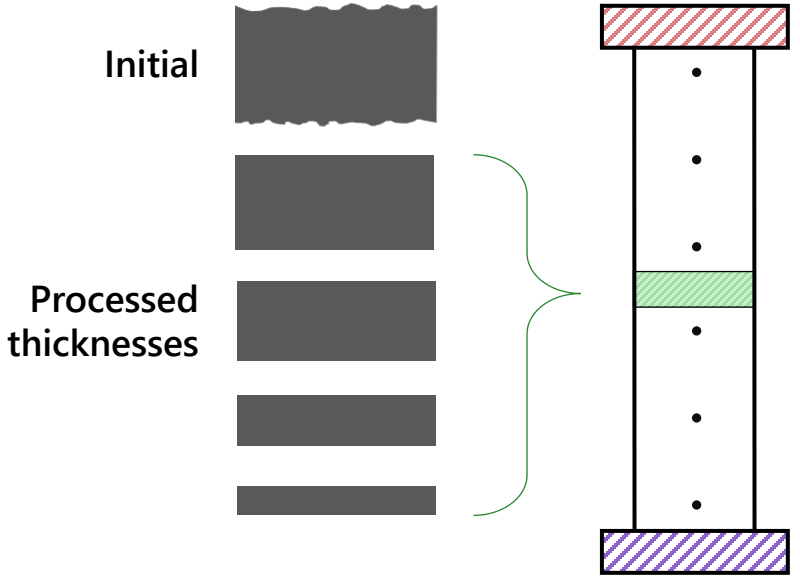
Underfill material



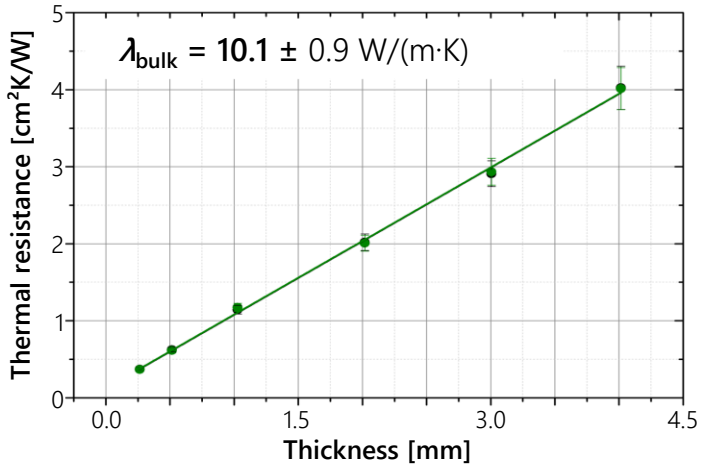
Carbon fiber reinforced polymer



Sample preparation tool



Bulk thermal conductivity of highly conductive polymer



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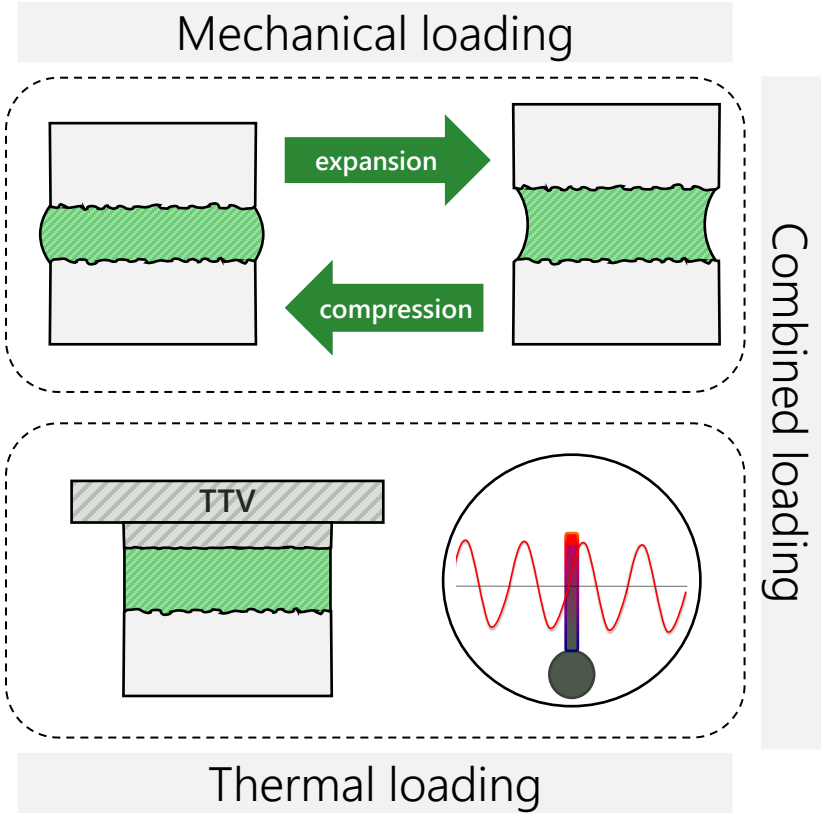
Ageing investigations with TIMA®



Long-term testing

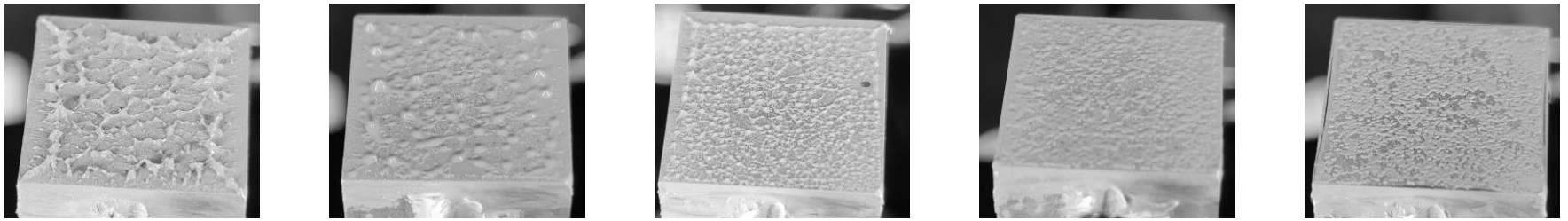
- High-temperature duration test
- In-situ curing characterization

Mechanical loading

- Cyclic thickness variation
- Compression & decompression
- Repeated tension and release
- Long-term compression

Thermal loading

- Temperature cycling
- TIM1 power profile cycling



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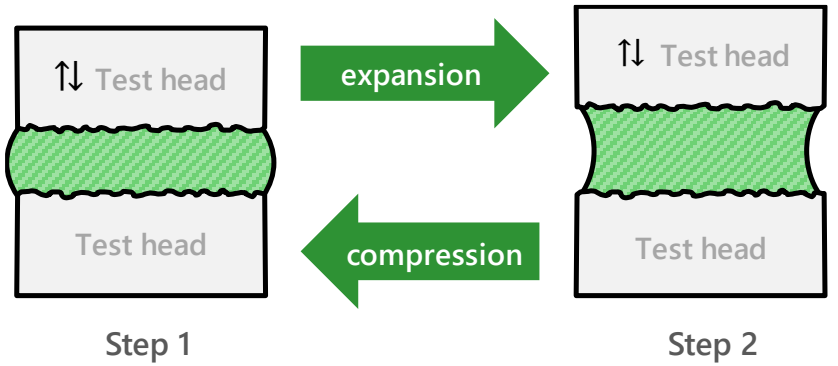
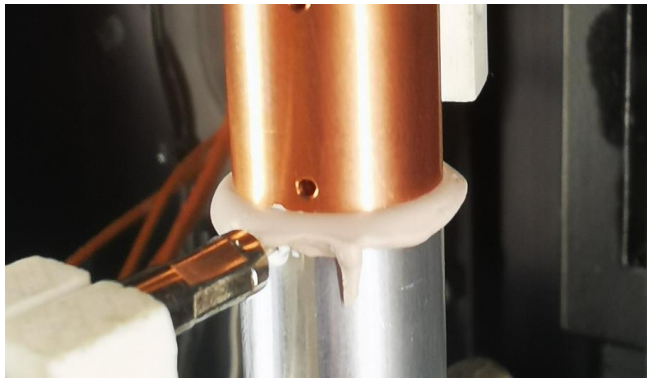
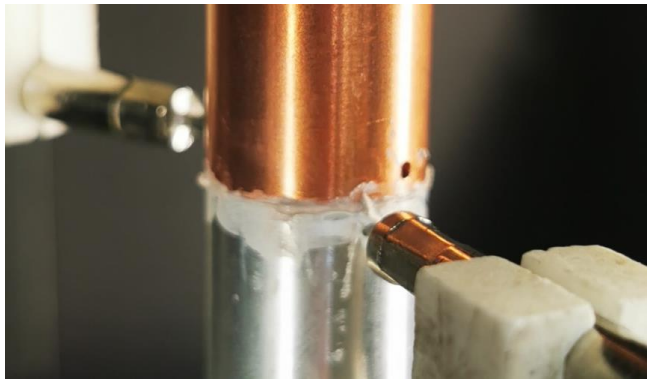
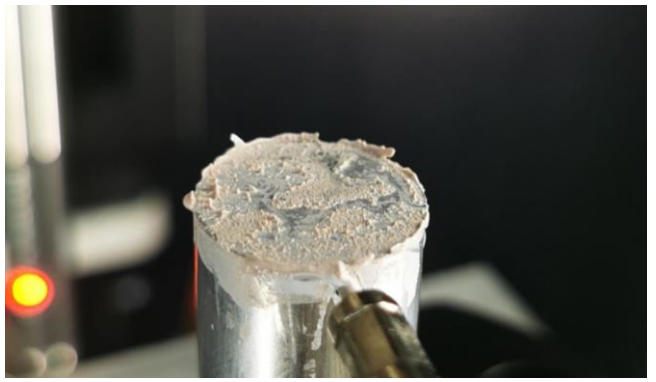
Ageing investigation cured gap filler

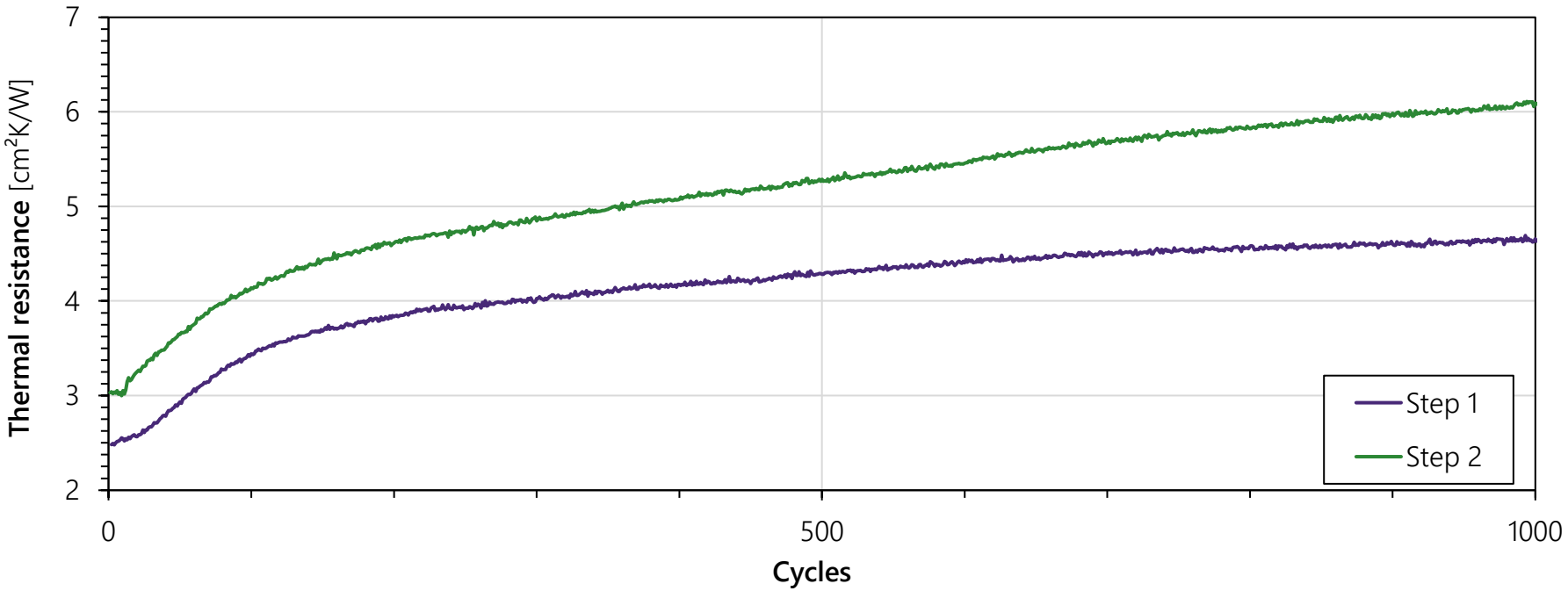
- Initial thickness of 300 µm
- 80°C sample temperature
- +10% gap width variation
- 90% Rth increase
- Pump-out and dry-out effect











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Conclusion

The System Key Characteristics

- Highly compact
- Robust and user-friendly
- Comprehensive
  - Bulk & eff. thermal conductivity
  - Effective and interface resistance
  - Pressure dependence
  - Temperature dependence
  - Process dependence
- Full ASTM D 5470 coverage
- Up to 150°C sample temp.
- 300 N clamping or tensile force

The Edge Unique Selling Points

- Automated testing
- Custom contacting surfaces
- Cured material characterization
  - Adhesives
  - Resins
  - Gap fillers
- Phase change material testing
- In-situ aging investigations
- Burn-in testing

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