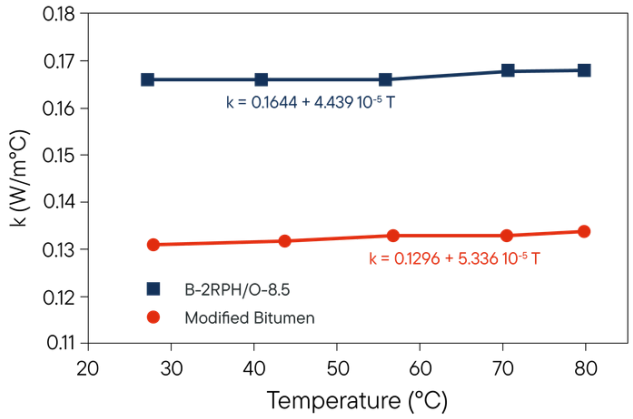
Enhancing Energy Efficiency in Sustainable Roofing Systems

THB L56 Evaluation of Thermal Conductivity in Bio-Based and Recycled Roofing Binders

The development of energy-efficient roofing materials plays a key role in reducing building cooling loads and mitigating urban heat island effects. In this study, bio-based and recycled roofing binders were investigated and compared to conventional polymer-modified bitumen. Thermal conductivity measurements were performed using the LINSEIS THB L56 to evaluate heat transfer properties and support the development of sustainable roofing solutions.

Measurement Setup

- Instrument: LINSEIS THB L56
- Method: Transient Hot Bridge (THB)
- Sensor: Type A sensor with metal frame
- Sample geometry: Two identical samples, 20 × 40 × 5 mm
- Temperature range: 30 °C to 80 °C
- Replicates: 10 measurements per temperature point



The thermal conductivity measurements demonstrate the potential of sustainable roofing materials for energy-efficient building applications.

Key observations include:

- Stable thermal conductivity across the temperature range
- Approximately 14% reduction in heat transfer
- Lower surface temperatures under solar exposure
- Improved thermal performance of the roofing system

The results demonstrate the effectiveness of sustainable roofing binders for reducing heat transfer and improving building energy efficiency.

Interpretation

The observed behavior can be attributed to:

- Optimized material composition
- High solar reflectance
- Stable thermal conductivity
- Reduced heat transfer through the roofing system

This results in:

- Lower roof surface temperatures
- Reduced cooling demand
- Improved building energy efficiency

Industrial Relevance

THB thermal conductivity measurements support:

- Sustainable roofing materials
- Cool roof technologies
- Energy-efficient buildings
- Building insulation systems
- Green construction materials
- Urban heat island mitigation

Conclusion

The LINSEIS THB L56 enables precise characterization of the thermal conductivity of advanced roofing materials. Understanding the heat transfer behavior of sustainable binders is essential for optimizing roof performance and improving building energy efficiency. These insights support the development of next-generation roofing systems for sustainable construction.

Source:
Alvarez-Barajas, R., Cuadri, A. A., Delgado-Sánchez, C., Navarro, F. J., Partal, P.
Non-bituminous Binders Formulated with Bio-Based and Recycled Materials for Energy-Efficient Roofing Applications.
Journal of Cleaner Production, 2023.
Adapted from thermal conductivity measurements performed using a LINSEIS THB L56 (formerly designated as THB 100).