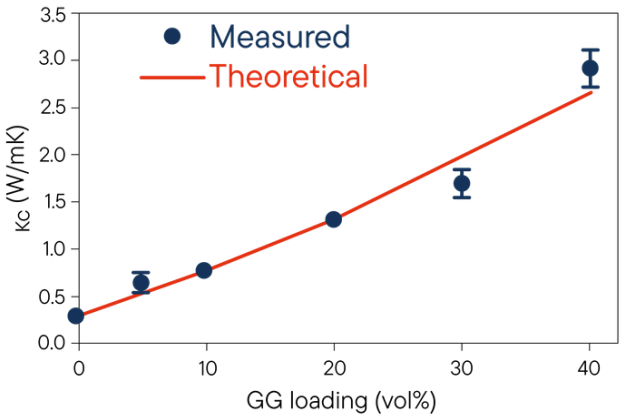
Thermal Conductivity of Graphene-Reinforced LDPE Composites

LFA Analysis of Thermally Conductive Polymer Composites

Laser Flash Analysis (LFA) enables the determination of thermal diffusivity and thermal conductivity of polymer materials. In this application example, graphene-filled LDPE composites were investigated using the Linseis LFA L51 (former designation: LFA 500 Xenon Flash). The measurement provides valuable information about heat transport performance in thermally conductive polymers.

Measurement Setup

- Instrument: Linseis LFA L51 (former designation: LFA 500 Xenon Flash)
- Sample: Graphene-filled LDPE composites
- Sample Geometry: Disc samples, Ø 25 mm, thickness < 2 mm
- Measurement: Thermal diffusivity and thermal conductivity
- Application: Thermally conductive polymer materials



The LFA measurement reveals the influence of graphene loading on the thermal conductivity of the investigated LDPE composites.
Key observations include:

- Continuous increase in thermal conductivity with graphene content
- Significant enhancement above 20 wt.% filler loading
- Highest thermal conductivity at 40 wt.% graphene content
- Formation of efficient heat-conducting pathways
- Good agreement with theoretical predictions

The results demonstrate the effectiveness of graphene fillers for improving thermal transport in polymer materials and optimizing thermal management performance.

Interpretation

The observed thermal conductivity enhancement can be attributed to:

- Formation of conductive graphene networks
- Improved heat transfer through the composite
- Reduced thermal resistance within the material

This results in:

- Enhanced thermal management
- Improved heat dissipation
- Greater suitability for engineering applications

Industrial Relevance

LFA measurements are widely used for:

- Thermally conductive polymers
- Electronic components
- Thermal management materials
- Lightweight composite structures
- Advanced polymer development

Conclusion

The measurements performed with the Linseis LFA L51 demonstrate the significant influence of graphene fillers on the thermal conductivity of polyethylene composites. The results show that optimized filler loading can increase thermal conductivity by nearly one order of magnitude, enabling the development of lightweight polymer materials with improved heat management performance.

Source:
Usman, C., Mabrouk, A., Abdala, A.
Enhanced thermal conductivity of polyethylene nanocomposites with graphene, granulated graphene, graphene nanoplatelet, and their hybrids.
International Journal of Energy Research, 2022.
Adapted from thermal diffusivity measurements performed using a Linseis LFA 500 Xenon Flash (current designation: Linseis LFA L51).