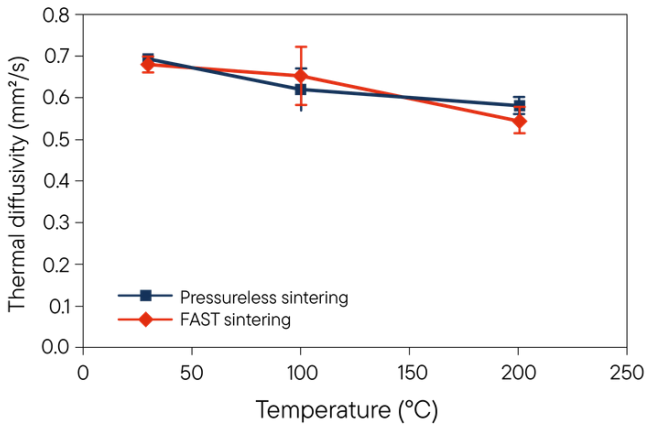
Thermal Diffusivity of High-Entropy Pyrochlore Ceramics

LFA L52 Characterization of Advanced Thermal Barrier Materials

High-entropy ceramics are promising materials for next-generation thermal barrier coatings due to their exceptionally low thermal diffusivity. Accurate characterization of heat transport is essential for evaluating their performance in high-temperature applications. In this study, thermal diffusivity measurements were performed using a LINSEIS LFA L52 to compare pressureless-sintered and FAST-sintered high-entropy pyrochlore ceramics. The results provide valuable insight into the influence of the sintering process on thermal transport properties.

Measurement Setup

- Instrument: LINSEIS LFA L52
- Material: High-Entropy $RE_2Zr_2O_7$ Pyrochlore Ceramic
- Temperature Range: Room Temperature to 200 °C
- Atmosphere: Nitrogen
- Measurement: Thermal Diffusivity
- Application: Thermal Barrier Coatings



The laser flash measurements reveal low thermal diffusivity for both sintering routes over the investigated temperature range.
Key observations include:

- Thermal diffusivity decreases with increasing temperature
- FAST-sintered samples exhibit slightly higher diffusivity
- Pressureless-sintered samples show lower heat transport
- Both materials maintain excellent thermal insulation properties

The results demonstrate the suitability of high-entropy pyrochlore ceramics for advanced thermal barrier applications.

Interpretation

The observed behavior can be attributed to:

- Strong phonon scattering
- High configurational entropy
- Microstructure differences between sintering methods
- Temperature-dependent heat transport

This results in:

- Low thermal diffusivity
- Excellent thermal insulation
- Reliable high-temperature performance

Industrial Relevance

Laser Flash Analysis measurements support:

- Thermal barrier coating development
- High-temperature ceramics
- Aerospace components
- Energy and power systems
- Gas turbines
- Advanced ceramic materials

Conclusion

The LINSEIS LFA L52 enables precise characterization of thermal diffusivity in advanced high-entropy ceramics. The measurements confirm the excellent thermal insulation capability of the investigated pyrochlore materials, making them promising candidates for thermal barrier coatings and other high-temperature applications requiring efficient heat shielding.

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Source:
Matović, B., Zagorac, D., Cvijović-Alagić, I., Zagorac, J., Butulija, S., Erčić, J., Hanzel, O., Sedlák, R., Lisnichuk, M., Tatarko, P. Fabrication and Characterization of High Entropy Pyrochlore Ceramics. Boletín de la Sociedad Española de Cerámica y Vidrio, 2021.
Adapted from thermal diffusivity measurements performed using a LINSEIS LFA L52 (formerly designated as LFA 1000).