Electrical instruments based thermal conductivity optimization on sintering of nanocomposites of Al and TiB with and without fly ash

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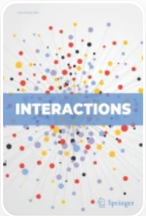

Interactions

Aims and scope

Submit manuscript

T. Sathish & A. Parthiban

Abstract

In the pursuit of enhancing thermal characteristics tailored for electrical instrument parts operating in high-temperature environments, a meticulous process of composite preparation unfolds. These composites undergo varying volume percentages of formulation via sintering, adjusting critical parameters including compaction pressure (ranging from 200 MPa to 400 MPa), sintering temperature (varying from 500°C to 600°C), and sintering duration (ranging between 60 min and 180 min). Subsequent measurement of thermal conductivity elucidates the material's heat transfer capabilities, guiding the optimization of operational parameters. Notably, composites containing fly ash exhibit diminished thermal conductivity compared to their counterparts sans fly ash.

However, a distinctive superiority emerges within the composite incorporating fly ash when subjected to a compaction pressure of 400 MPa, sintering temperature of 600 °C, and a sintering duration of 60 min, showcasing a notable enhancement in thermal conductivity, thereby underscoring the intricate interplay between formulation parameters and material properties in the quest for optimal performance in high-temperature environments.

Data availability

No datasets were generated or analysed during the current study.

Code availability

Not applicable.

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Author information

Authors and Affiliations

Department of Mechanical Engineering, Saveetha School of Engineering, SIMATS, Chennai, Tamil Nadu, India

T. Sathish

Department of Mechanical Engineering, Vels Institute of Science, Technology and Advanced Studies (VISTAS), Chennai, Tamil Nadu, India

A. Parthiban

Contributions

T.S: Conceptualization, Software, Visualization, Validation, Data Curation, Investigation, Methodology, Writing - original draft, Writing - review & editing. A.P: Conceptualization, Formal analysis, Writing - review & editing.

Corresponding author

Correspondence to T. Sathish.

Ethics declarations

Ethical approval

Not applicable.

Consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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