



## Materials Today: Proceedings

Volume 43, Part 2, 2021, Pages 1720-1723

---

# A review on aluminium (Al7050) metal matrix composite characteristics reinforced with titanium

Muthukumaran Ramasamy <sup>a</sup>  , [Ajith Arul Daniel <sup>b</sup>](#), [Nithya M. <sup>c</sup>](#)

Show more 

 Share  Cite

---

<https://doi.org/10.1016/j.matpr.2020.10.257> 

[Get rights and content](#) 

---

## Abstract

Aluminium metal matrix composites (AMMC) have potential demand in various structural applications such as aerospace, construction, automobile and even in medical fields due to their remarkable characteristics in comparison with conventional alloys. Al7050 is widely adopted and suitable alloy among the Al-7xxx series for transportation applications. The physical, mechanical, tribological and microstructure characteristics of Al7050 metal matrix can still be improved with the addition of suitable reinforcing materials. The objective of this review is to provide an overview of titanium as reinforcement material in Al7050 MMC and to elaborate on the change in mechanical characteristics due to the addition of reinforcement.

---

## Introduction

Metal Matrix Composite (MMC) is a mixture of a base metal and suitable reinforcing material to make metal matrix suitable for specific industrial applications. Aluminium is the most commonly used metal for structural light weight applications among the other alloys/metals. The manufacture of automotive and aircraft parts employs Al7050 due to its comprehensive superior properties such as lightweight, high strength and toughness. To overcome few draw backs during the casting and machining of Aluminium metal [1], it is being reinforced with different carbide or oxide materials [2]. The wide range of reinforcing materials enhances the features and provides an effective final product for specific purpose. Over the last few decades, most of the researchers focused on improving the characteristics of Al7050 with appropriate reinforcing material such as TiB<sub>2</sub> [1], [3], [4], [5], [6], [7], [8], [9], [10], [11], [12], TiC [13], [14], Ni-Ti [15], Ti [16], Graphene[17], [18], [19], [20], [21], [22], SiC [2], [23], [24], Si [25]. This paper/review provides an extensive report on Titanium reinforced Aluminium (Al7050) Metal Matrix Composites, optimum percentage of reinforcement and how it affects the physical and mechanical properties of Al7050 MMC.

---

## Access through your organization

Check access to the full text by signing in through your organization.

Access through **your organization**

---

## Section snippets

### Titanium DiBoride (TiB<sub>2</sub>)

TiB<sub>2</sub> is the frequent choice of reinforcement in Al7050 MMC by many researchers due to good damping, high specific strength and modulus. Gen Liu [1], [3] fabricated 6 wt% TiB<sub>2</sub> – Al7050 using flux-assisted synthesis and the composites were regulated at 468°C with equal intervals to avoid overburnt during homogenization process. The strip type arrangement increases the rate of homogenization and transformation phase slows down the homogenization. The study also found that increase in pre strain...

### Conclusion

This article presents an overview of Titanium as reinforcing material in manufacture of Al7050 composite in different forms such as TiB<sub>2</sub>, TiC, Ni-Ti, Ti and how it has impacted on the performance of the composite.

- TiB<sub>2</sub> is the commonly used reinforcing material compared to other forms of Titanium and the optimum percentage inclusion can be arrived as 6%....
- The addition of TiC particles leads to significant decrease in relative density and increase in porosity [26]....
- A few commonly used casting methods ...

...

## CRedit authorship contribution statement

**Muthukumaran Ramasamy:** Conceptualization, Methodology, Writing - original draft.

**Ajith Arul Daniel:** Validation, Visualization, Supervision. **Nithya M.:** Data curation, Writing - review & editing....

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper....

[Special issue articles](#)   [Recommended articles](#)

---

## References (26)

T. Sathish *et al.*

[Wear behaviour analysis on aluminium alloy 7050 with reinforced SiC through taguchi approach](#)

Integr. Med. Res. (2020)

H. Li *et al.*

[Microstructure and mechanical properties of an in-situ TiB<sub>2</sub> / Al-Zn-Mg-Cu-Zr composite fabricated by Melt-SHS process](#)

Mat. Sci. & Engg. (2018)

N. Gangil *et al.*

[Investigation on friction stir welding of hybrid composites fabricated on Al – Zn – Mg – Cu alloy](#)

Integr. Med. Res. (2019)

H. Fallahdoost *et al.*

Dual functions of TiC nanoparticles on tribological performance of Al / graphite composites

J. Phys. Chem. Solids (2016)

A. Ranganathan *et al.*

Mechanical Characterization of AA7050-TiC Metal Matrix Composites under as Cast as condition

Mater. Today Proc. (2018)

S. Venkatesan *et al.*

Wear Property Evaluation of Aluminum Alloy (AA7050) Metal Matrix Composite Reinforced with Graphene Fabricated by Stir and Squeeze Cast Processes

Mater. Today Proc. (2020)

S. Venkatesan *et al.*

Characterization on Aluminum Alloy 7050 Metal Matrix Composite  
Characterization on Aluminum Alloy 7050 Metal Matrix Composite Reinforced with Graphene Nanoparticles Reinforced with Graphene Nanoparticles School for Costing models capacity optimization in Industry

Procedia Manuf. (2019)

S. Venkatesan *et al.*

Tensile behavior of aluminum alloy (AA7050) metal matrix composite reinforced with graphene fabricated by stir and squeeze cast processes

Sci. Technol. Mater. (2018)

I.S. Lee *et al.*

Particle-reinforced aluminum matrix composites produced from powder mixtures via friction stir processing

Comp. Sci. Tech. (2011)

G. Liu

Microstructures evolution of nano TiB<sub>2</sub> 7050Al composite during homogenization

Mater. Charact. (2019)

[View more references](#)

---

## Cited by (8)

### [Hybrid material usage in TPMS forms fabricated by additive manufacturing, comparison of mechanical strength of lattices produced with AlSi10Mg and 7050](#)

2023, Materials Today Communications

[Show abstract](#)

### [Investigation on surface roughness of aluminium \(Al7050/TiC/BN\) hybrid metal matrix](#)

2021, Materials Today: Proceedings

*Citation Excerpt :*

...Previous research done on Aluminium composite reinforced with TiC particles, reveal that there is increase in strength and wear behaviour. However, the increase in percentage of TiC, increases the porosity and negatively impacts on the microstructure and deteriorate particle packing density [14]. Hence, the present study focuses on adopting hybrid reinforcement viz., TiC and BN to investigate the surface roughness of Al7050 composite specimen casted through compo-casting and subjected to milling operation....

[Show abstract](#)

### [Microstructure and tribological behavior of Al–TiC composite strips fabricated by a multi-step densification method](#)

2024, Scientific Reports

### [Effect of natural aging on Portevin-Le Chatelier effect of TiB<sub>2</sub>/7050 aluminum matrix composites](#)

2024, Jinshu Rechuli/Heat Treatment of Metals

### [Investigation on Surface Roughness of Aluminium \(Al7050/TiC/BN\) Composite Through Wire Electric Discharge Machining](#)

2022, Lecture Notes in Mechanical Engineering

# Plane machining by inner-jet electrochemical milling of $TiB_2$ /7050 aluminum matrix composite ↗

2021, Applied Sciences (Switzerland)



[View all citing articles on Scopus ↗](#)

---

[View full text](#)

© 2020 Elsevier Ltd. All rights reserved. Selection and peer-review under responsibility of the scientific committee of the International Conference on Advanced Materials Behavior and Characterization.



All content on this site: Copyright © 2024 Elsevier B.V., its licensors, and contributors. All rights are reserved, including those for text and data mining, AI training, and similar technologies. For all open access content, the Creative Commons licensing terms apply.

