

**EFFECT OF SIC-GRAPHITE REINFORCEMENT AND
TEMPERATURE ON THE MECHANICAL PROPERTIES OF AA7075
ALUMINIUM ALLOY**

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JULY 2022

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ALUMINIUM ALLOY**

BY

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**A DISSERTATION SUBMITTED TO THE SCHOOL OF
POSTGRADUATE STUDIES OF COVENANT UNIVERSITY, OTA,
OGUN STATE, NIGERIA IN PARTIAL FULFILMENT OF THE
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(M.Eng) DEGREE IN MECHANICAL ENGINEERING, IN THE
DEPARTMENT OF MECHANICAL ENGINEERING, COLLEGE OF
ENGINEERING, COVENANT UNIVERSITY, OTA.**

JULY 2022

ACCEPTANCE

This is to attest that this thesis is accepted in partial fulfillment of the requirements for the award of degree of Master's in Mechanical Engineering in the Department of Mechanical Engineering, College of Engineering, Covenant University, Ota.

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DECLARATION

I, **ALUKO OLALEKAN MICHEAL (20PCM02099)** declare that this research work titled "**EFFECT OF SIC-GRAPHITE REINFORCEMENT AND TEMPERATURE ON THE MECHANICAL PROPERTIES OF AA7075 ALUMINIUM ALLOY**" was carried out by me under the supervision of Dr. Olufunmilayo O. Joseph of the Department of Mechanical Engineering, College of Engineering, Covenant University, Ota, Nigeria. I attest that this dissertation has not been presented either wholly or partially for the award of any degree elsewhere, and the results of this research were obtained by tests carried out in the laboratory. All sources of data and scholarly information used in this dissertation are duly acknowledged.

ALUKO, OLALEKAN MICHEAL

Signature & Date

CERTIFICATION

We certify that the thesis titled “**EFFECT OF SIC-GRAPHITE REINFORCEMENT AND TEMPERATURE ON THE MECHANICAL PROPERTIES OF AA7075 ALUMINIUM ALLOY**” is an original research work carried out by **ALUKO, OLALEKAN MICHEAL (20PCM02099)** in the Department of Mechanical Engineering, College of Engineering, Covenant University, Ota, Ogun State, Nigeria, under the supervision of Dr. Olufunmilayo O. Joseph. We have examined and found this work acceptable as part of the requirements for the award of Master (M. Eng) degree in Mechanical Engineering.

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DEDICATION

This research work is dedicated to God, my parents, and my siblings, for their sincere love, prayers, and unwavering support at points when the work was supposedly getting delayed.

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ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

| | |
|-------|--|
| ASTM | American Society for Testing and Materials |
| CCCs | Carbon-Carbon Composites |
| CMCs | Ceramic Matrix Composites |
| EC | Electrical Conductivity |
| EU | European Union |
| EDX | Energy-Dispersive X-Ray Spectroscopy |
| FRCs | Fibre-Reinforced Composites |
| MMCs | Metal Matrix Composites Nm - |
| NF | Nanofiltration |
| NP | Nanoparticle |
| NPs | Nanoparticles |
| FRCs | Fibre-Reinforced Composites |
| pH | Potential Hydrogen |
| PAC | Powder Activated Carbon |
| PMCs | Polymer Matrix Composites |
| PPM | Parts Per Million |
| PRCs | Particle-Reinforced Composites |
| SI | International System Units |
| SEM | Scanning Electron Microscopy |
| AMC | Aluminium Matrix Composite |
| ALMMC | Aluminium Metal Matrix Composites |
| SiC | Silicon Carbide |
| UTS | Ultimate Tensile Strength |
| OCP | Open Circuit Potential |
| LSV | Linear Sweep Voltammetry |
| XRD | X-ray Diffraction |
| XRF | X-ray Fluorescence |
| RHTM | Rockwell Hardness Testing Machine |
| STEM | Scanning Transmission Electron Microscopy |
| UITM | Universal Impact Testing Machine |

ABSTRACT

Most engineering applications benefit greatly from the usage of aluminum composite materials, particularly due to their excellent weight to strength ratio. The mechanical properties of metals like aluminum are said to be the basic prerequisites for their application, this implies that each metal or alloy's industrial and scientific application is governed by its properties. Owing to this important requirement Some aluminum materials have been discovered to be lacking in particular areas as a result of flaws such poor ductility, weak strength, poor thermal conductivity, and difficult to machine. Silicon carbide and graphite were reinforcements on aluminum alloy 7075 using weight percentages of 5 wt and 10 wt. of Sic and graphite constant. Based on its availability, the stir casting process was chosen for the investigation. Twelve distinct samples of the developed composite materials were tempered at five different temperatures from 150°C to 350°C for the reinforced samples, and at the same tempering temperatures for six control samples of the aluminum alloy base material to serve as control. Tensile strength, hardness, toughness, corrosion resistance, and microstructural analyses were all determined from the samples. The results show that the sample with 5 weight percent silicon carbide reinforcement had a fine microstructure and showed the most noticeable improvements in mechanical. It was also observed that as tempering temperature increased, hardness and toughness improved in all reinforced samples. The study has demonstrated the importance of synthetic materials and heat treatment for aluminium composites.

Keywords: Composite, Aluminium, Silicon carbide, Graphite