

TRIBOLOGICAL BEHAVIOUR OF THE AL7075-ALN METAL MATRIX COMPOSITES

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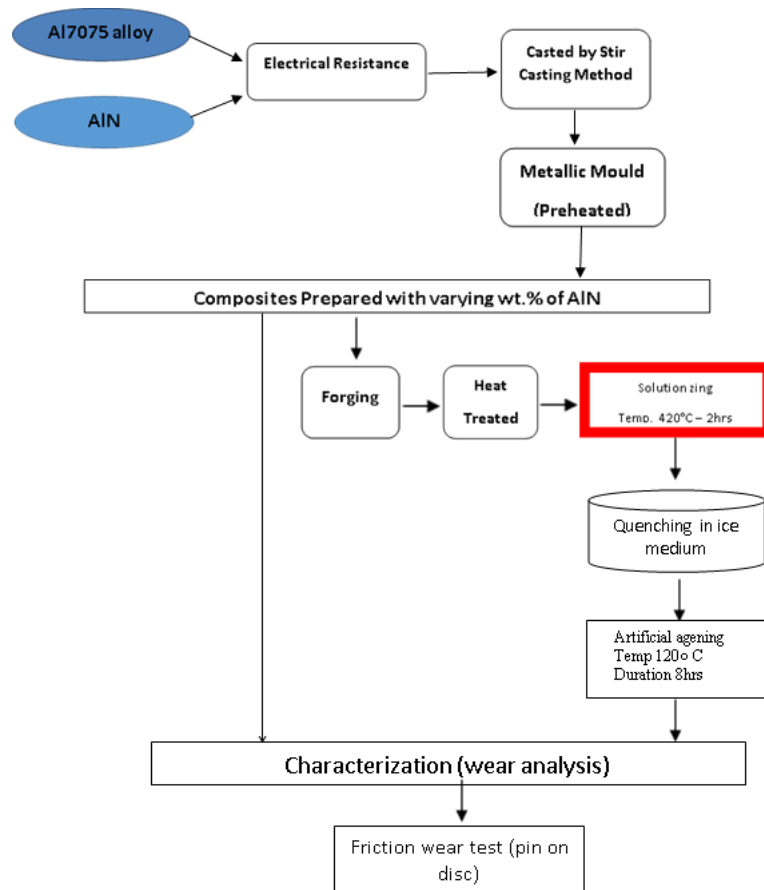
Introduction:

In several sector metal matrix composites are gaining more popularity due to its lighter density and improved properties when compared with metals, especially in application where strength and weight are important. Al/Al alloy based MMC's are being used in several applications as a material system such as push rods, cylinder, connecting rod, brake disc and piston etc. [1] in particular, the properties of composite materials depends on the nature of the reinforcement and the matrix and relative content of reinforcement [2]. Aluminium nitride is selected as the reinforcement material taking in to consideration of its superior properties like good thermal expansion co-efficient, high strength, thermal suitability and its good dispersion with aluminium matrix [3]. Al7075 alloy have lots of benefits like corrosion resistance, formability, weldability and low cost. For production of aluminium particulate reinforced composite stir casting method considered to be promising method among various conventional processing methods [4]. In this present work, an attempt has been made to develop of As-cast aluminium alloy (Al7075)-Aluminium nitride particulate composite to study the mechanical properties by varying the Wt% of Aluminium Nitride particulate.

Objectives:

The main objective of present work focuses to investigate the tribological behavior of Al7075-AIN metal matrix composite. Al7075-AIN metal matrix composites has many potential applications especially in automotive and aerospace industries, due to their light weight to strength ratio and high wear resistance. Aluminum 7075 Alloy reinforced with Aluminum Nitride (AlN) composite by Liquid metallurgy method by varying the reinforcement aluminium nitride particulates from 0 wt. % to 10 wt. % in steps of 2 wt. %. The developed as cast Al7075 alloy and its composites were hot forged and subjected to heat treatment process (0,2,4,6,8,10 hours) with solutionizing temperature 470° C of 2 to 10 hours followed by quenching with different medium (ice, water, air) and artificial aging of temperature 120° C with duration of 2 hours. Tribological properties such as wear property, optical microstructure, SEM, XRD studies were conducted on both as cast and heated treated composites.

Methodology:



Results and conclusions:

Based on the study conducted on the Aluminium Nitride containing Al7075 composite material, the following conclusions can be made:

1. Al7075-aluminium nitride particulate reinforced composites were developed successfully using liquid metallurgy route followed by forging and T6 heat treatment.
2. Dry sliding wear rate decreases with increase in content of Aluminium nitride particulates in the Al7075 matrix alloy in both as-cast and heat treated composites.

Scope for future work:

1. To get even better understanding about the tribological characteristics of the Al7075-AlN particulate reinforced composites, further investigations on other extrinsic parameters like reinforcement size and size distribution, the matrix microstructure and the temperature and environmental factors are needed.
2. Since, the heat treated composites with different quenching media exhibited good mechanical and tribological properties. Further research work can be extended to other quenching media like brine solution, oil quenching etc.
3. The chilling effect on mechanical and tribological properties of Al7075-AlN particulate reinforced composites can be studied.
4. The study can also be extended to develop and characterize the hybrid metal matrix composites by adding reinforcement along with frit particulate in Al7075-AlN matrix alloy.

5. Use of FEM technique and statistical tools to optimize the process parameters of
6. the Al7075-AlN particulate reinforced composites, can be employed.